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## THE DIAGNOSIS OF CERTAIN DIFFICULT CASES OF TUBERCULOSIS

F. M. POTTENGER, M. D.
Monrovia, Calif.

Read before the Annual Meeting of the Medical and Surgical Association of the Southwest, El Paso, Texas, November 2 to 5, 1927.

The average case of frank pulmonary tuberculosis may be diagnosed with comparative ease by those who are conversant with the well-established methods of examining the chest, but there are certain borderline cases which are difficult for the most experienced. Likewise, tuberculosis, at times, involves structures other than pulmonary and causes difficulty to the diagnostician.

There are three groups of patients which offer especial difficulty in diagnosis, and which I wish to consider at this time, viz., children with unhealed primary focus or in whom early reinoculation has taken place; adults with unstable nervous and psychical balance, and individuals who make a slow recovery from acute respiratory infections.

### TUBERCULOSIS IN CHILDHOOD

Since tuberculous infection takes place in childhood, and since this infection of early years often fails to heal and so remains a potential and often an actual menace to the health and life of the child in providing a source whence reinoculations may take place, it is incumbent upon the medical profession to learn to recognize unhealed lesions and early metastases which arise from them, in order to avert serious disease.

It is not my purpose to discuss the lesions found in the various organs in childhood, such as those of bones, joints, meninges and visible lymphatic glands, but I wish rather to draw attention to that form of the disease which results from a failure of the primary pulmonary focus and its accompanying involvement of regional lymphatic glands to heal.

That tuberculosis both in children and in adults is capable of remaining in an unhealed state without producing serious extensions and grave symptoms. is well recognized. During the unhealed state, however, extensions may occur and toxins may make their escape from the foci of disease and, depending upon the degree of stability of the nervous and psychical state of the patient, produce a variable picture of disturbed growth and development.

It is a very important thing to know when to suspect activity in such unhealed lesions. The fact of the presence of tuberculosis in the child may be determined by a positive reaction to one of the various tuberculin tests, the cutaneous and intradermal being especially suited to children. In respect to the tuberculin test, however, it must be remembered that there are certain conditions of stress, particularly those which accompany such acute diseases as the exanthemata and influenza, and many conditions of low physical vitality, which cause a disappearance of allergy for a time, and so may cause a negative reaction to tuberculin even though tuberculous infection be present.

A positive reaction to tuberculin may always be interpreted as showing that tuberculous infection is present, which is information of great value at times. Some go further and believe that a marked prompt reaction signifies activity, and with this I am inclined to agree. This, however, leaves us in doubt in many undernourished children who, because of a depressed allergy produced by their low physical state, might fail to react markedly, even though active tuberculosis were present.

Lesions also may be detected by the x-ray in those children in whom calcification of the primary focus has partly or completely taken place. It must be borne in mind, however, that not all tuberculosis can be visualized by the x-ray and, further, that the de-

gree of activity of those unhealed lesions in childhood can not be accurately judged by shadows shown on the plate.

A child who shows a strong reaction to tuberculin and who fails to grow and develop normally, who develops an unstable nervous system, shows a disinclination to play, has a disinterestedness in or repugnance to food, shows a loss in weight or at least fails to gain, is subject to colds which take the form of bronchitis, and shows an elevation of temperature, and in whom no other cause for these symptoms can be found, should be considered as probably suffering from an unhealed tuberculous focus, even though no localizing factors may be found. The probability of an active tuberculous process being present is the greater, the stronger and the more quickly the tuberculin reaction appears, and the younger the child; and, particularly, if the child has had a prolonged intimate association with open tuberculosis.

The active lesions in such cases, as a rule, are in the tracheo-bronchial lymphatic glands and not readily detected by the usual methods of examination. If, on the other hand, the unhealed lesion should be in the lung, it is more easily detected and more likely to be found by some of the more refined methods of physical examination applicable to that organ, such as will be discussed later in this paper.

A careful clinical history should be taken and a thorough physical examination with tuberculin test and x-ray should be made of all underdeveloped, nervous children, to determine whether or not there are symptoms or signs of tuberculous involvement. Unfortunately, lesions of the tracheo-bronchial glands, as a rule, show only symptoms due to toxemia and there is nothing characteristic in the toxic symptoms of tuberculosis to aid one in differentiating them from symptoms produced by other toxins. Reflex and local symptoms, as a rule, are absent, although recurrent attacks of bronchitis are not uncommon. The diagnosis in many of these cases must be based on a careful analysis of all data obtained and be presumptive rather than positive.

## TUBERCULOSIS IN THE PHYSIOLOGICALLY UNSTABLE PATIENT

Many members of the human family possess an unstable or broken physiologic balance. Some are able to meet the ordinary demands that are made upon them and fail only to meet the unusual, while others are unable to accomplish ordinary tasks with efficiency. Such individuals may be well nourished or poorly nourished. The essential condition is disturbance in function. It may be caused by an inability properly to adjust to pathologic stimuli, such as we find in those with unstable nerves, with endocrine imbalance, and with inherently unstable body cells; or a failure to adjust psychically to one's surroundings. To this group belong so-called neurasthenics and psychasthenics, and many suffering from such endocrine disturbances as hypo and hyperthyroidism of mild degree, hypo and hyperpituitrism, hypo and hypergonadism, and hypoadrenia.

These various groups show variation in the problems which they present for solution, but I am considering them together for clinical convenience. They all present more or less the same problems in diagnosis in the tuberculosis clinic, because of the fact that they all possess a very unstable physiologic balance.

The readiness with which constitutional or reflex symptoms on the part of any patient make their appearance, depends on the stability of his neuromuscular mechanism; in other words, on the amount of pathologic stimulation, either of physical or psychical origin, that his neurocellular mechanism is able to withstand without response. An individual with unstable equilibrium will, at times, withstand continuous and prolonged bombardment of his nerve centers and cells without departure from normal. This fact does not seem to be sufficiently considered in dealing with patients.

Physiologically, we speak of the point at which nerve reaction occurs as the threshold of response. While this threshold differs in different individuals and under different circumstances, it shows one particular characteristic under all circumstances, that is, when once lowered as it is by being broken over, or still further lowered by being frequently broken over, it may become so low that the patient shows symptoms on what might seem to be very slight cause.

When this natural protective inhibition is broken down, as it always is in the group of patients which we are now discussing, their equilibrium becomes unstable. Any stimulus which exerts a harmful effect on nerves, endocrines or the body cells themselves, such as the toxins of tuberculosis; or any emotional adjustment required of them, such as that to the fact of having a serious illness with its domestic, social and economic stresses, produces a new harmful stimulation which results in widespread neurocellular imbalance. Unfortunately the group of general symptoms found in tuberculosis, as readily can be seen, are much the same as those usually manifested by this group of

patients. This adds to the difficulty of diagnosis.

On account of the instability in the neurocellular mechanism, such patients, when suffering from tuberculosis, show symptoms very easily. Lesions which would not affect the more stable, produce definite symptoms in these. While the patient whose reactive balance is so delicate that it is overturned at the least provocation, deserves unusual attention, he usually receives less than average and is branded as a complainer or impostor, those coming in contact with him failing to appreciate that he shows symptoms with a minimum of pathologic stimulation.

When such patients harbor an active tuberculosis in their bodies they usually respond readily to the effect of the toxins and show some of the following toxic or general group of symptoms:

SYMPTOMS OF PULMONARY TUBERCULOSIS

GROUP I.

(General and Toxic)

| *Caused by harmful stimulation of* | *Symptoms* |
|---|---|
| I. Nervous system in general. | 1. Malaise |
| II. Endocrine system in general. | 2. Lack of endurance |
| III. Body cells. | 3. Loss of strength |
| | 4. Nervous instability |
| | 5. Diminished digestive activity |
| | 6. Increased metabolic rate |
| IV. Sympathetic nervous system. | 7. Loss of weight |
| Sympathetic endocrines, particularly adrenals and thyroid. | 8. Increased pulse rate |
| | 9. Night sweats |
| | 10. Temperature (partially). |

The fact that these patients show this same group of symptoms whether tuberculous or not, adds to the difficulty in diagnosis. They usually suffer from malaise, lack of enduracne and nerve irritability; loss of appetite and weight, and rapidity of heart action affect them at recurring intervals; and even a rise of a few tenths in temperature may result from the increased metabolism often found in the nervous patient, together with an interference with heat elimination due to a slight constriction of the vasomotor control of his skin.

So, from this group of symptoms we can hardly expect to diagnose an early active tuberculosis in patients who normally possess this background of neurocellular instability.

If the lesion is in the tracheo-bronchial glands the only symptoms which are regularly present will be those of this group and we are forced to make a diagnosis of suspected tuberculosis only, and keep the patient under surveillance until we can satisfy ourselves of the truth or error of our suspicion.

If the lesion is in the lung, on the other hand, even though it be slight, other symptoms come to our aid. Some of those belonging to the reflex group will manifest themselves as shown in table on next page.

Among the most common reflex symptoms to manifest themselves in the presence of active pulmonary tuberculosis, are those on the part of the larynx and the muscles of the shoulder girdle and diaphragm. Hoarseness and irritation of the throat with a tendency to clear the throat or cough, and the reflex in the muscles of the shoulder girdle and the diaphragm are commonly present. This muscle reflex shows both as an increased tension in the palpable muscles of the shoulder girdle and in a fixing of the hemithorax on the side of active disease, noted as a lessened motion. This latter, being due to the reflex shortening of the scaleni attached to the first and second ribs above and the crura and central tendon of the diaphragm below, belongs to the group of defense reactions of the body, and is constant in the presence of active disease.

When these symptoms are present in conjunction with some of those of Group I. the evidence is convincing of a pulmonary involvement.

I recognize the fact that limited motion of the thorax may be caused by pleural involvement acute or chronic, lessened elasticity of the pulmonary tissue, or a fixing of the mediastinal structures, as a result of mediastinitis. If any of these conditions are present to cause lessened motion, an acute process such as an active tuberculosis in the corresponding lung may still be suspected if increased tension is present in the neck muscles, particularly the sterno cleido mastoideus, scaleni, trapezius and levator anguli scapulae.

Rarely do we find any of the following localizing symptoms, those due to the tuberculous process **per se**, present in this group of cases as early as the symptoms of Groups I and II. This is evident from the fact that an unstable physiologic equilibrium is upset and shows general and reflex effects before the lesion becomes extensive, although it should be remembered, as an occasional exception, that a pleural involvement might be present very early.

## SYMPTOMS OF PULMONARY TUBERCULOSIS

### GROUP II.

(Reflex)

| *Afferent nerves* | *Symptoms* | *Efferent nerves* |
|---|---|---|
| Inflammation of lung | Hoarseness | Laryngeal nerves |
| | Laryngeal irritation | Superior laryngeal nerve |
| | Cough | Laryngeal, and nerves to all expiratory muscles with inhibition of nerves to inspiratory muscles. |
| Afferent through (vagus) parasympathetics | Inhibition of heart | Motor fibres of cardiac vagus |
| | Increased muscle tonus, and glandular secretion in gastrointestinal canal | Motor fibres of gastric and intestinal parasympathetics |
| | Pylorospasm | Motor fibres of pyloric parasympathetics |
| | Flushing of face | Sensory fibres of trigeminus |
| | Spasm of sternocleidomastoideus and trapezius | Spinal accessorius |
| | Degeneration and deviation of tongue from median line | Hypoglossus |
| | Degeneration of facial muscles | Trigeminus and facialis |
| Afferent through sympathetics | Flushing of ear | Third sensory cervical |
| | Dilatation of pupil | Motor from Budge's Centre (lower cervical and upper dorsal) |
| | Spasm of muscles of shoulder girdle and diaphragm | Cervical motor nerves, IInd to VIIIth |
| | Lessened motion of chest-wall, partly due to muscle spasm as above | Cervical sensory nerves, IInd to VIIIth |
| | Pain above 2nd rib and spine of scapula (superficial) | Cervical motor nerves, particularly IIIrd, IVth and Vth |
| | Pain in muscles of shoulder girdle (deep pain) | Cervical sensory and motor, IInd to VIIIth. |
| | Degeneration of skin and subcutaneous tissue above 2nd rib anteriorly and spine of scapula posteriorly | Cervical sensory nerves, IIIrd, IVth and Vth |
| | Degeneration of muscles of shoulder girdle | Cervical sensory and motor, IInd to VIIIth |

SYMPTOMS OF PULMONARY TUBERCULOSIS

GROUP III

(Due to the Tuberculous Process, *per se*)

Spitting of blood.
Sputum (with or without tubercle bacilli).
Pleurisy (tuberculosis of the pleura)
Frequent and protracted colds (tuberculous bronchitis).

Active tuberculosis in this group of patients is very difficult to diagnose if we rely on clinical history, auscultation, percussion, sputum and x-ray examination; yet its recognition is made possible in most instances if a careful analysis of all available data is made.

We must always remember that they show symptoms with a lesser stimulation than those with more normal balance; also, that we can not place much reliance on the toxic or general group of symptoms alone; and further, that some of the reflex group is nearly always detectable if the lung parenchyma is involved, particularly those on the part of the larynx, the increased tension of the muscles of the shoulder girdle and lessened motion of the hemithorax in which the active disease is present. Frequent colds may be present when the hilum glands are enlarged and unhealed; pleurisy and blood-spitting may be occasionally present; but bacillary sputum is rarely found. The diagnosis, as a rule, must be based upon a combination of symptoms belonging to Group I and some of either Group II or III.

TUBERCULOSIS AND CONDITIONS WHICH FOLLOW ACUTE RESPIRATORY INFECTION

During the last few years a group of cases following acute respiratory diseases has appeared in the chest clinic, which have been very hard to differentiate from pulmonary tuberculosis. The difficulty has been exaggerated because reactivation of tuberculosis often follows these acute infections. Patients suffering from both conditions quite often show a slight rise in temperature, a persistent cough, more or less depression of their general strength, and, at times, recurrent attacks in which there is an increase in cough and temperature and expectoration, the latter sometimes containing blood. It is very difficult to determine in such instances whether we are dealing with tuberculosis or postinfluenzal infections.

In such cases we can not rely so much on clinical history, because of the fact that a tuberculous infection may be reactivated by an acute respiratory infection. Nor can we rely on the toxic group of symptoms, because they may be identical in both instances. In the reflex group, however, I would like especially to emphasize the fact that the reflexes from the lung are not so general in the acute respiratory infections, where the lesion is more definitely confined to the bronchi, as they are in pulmonary tuberculosis, where we have parenchymal inflammation. To be sure, the reflex on the part of the larynx, the hoarseness and irritation and the tendency to cough, is present in both diseases, but the reflex in the muscles which leads to increased tension of those of the shoulder girdle and a fixing of the side rarely is found in the non-tuberculous diseases. On the contrary, it is practically always found in active pulmonary tuberculosis, because the latter produces a more widespread parenchymal involvement.

Should tubercle bacilli be present, there should be no difficulty in making the diagnosis. In order to avoid wrong information, however, the sputum in these doubtful cases should be collected for twenty-four, forty-eight, or even seventy-two hours, and be examined by some of the methods which require concentration of the bacilli.

On physical examination of these two types of infection, there is usually some difference in the rales that are present, and yet this can not always be relied upon, because we may find both conditions present without rales, and, further, we may find no other readily detectable changes by the stethoscope. The x-ray may or may not show a difference in shadows. However, if, upon the injection of tuberculin, rales should be detected by the stethoscope, or shadows indicative of a focal allergic reaction should appear on the plate, then our diagnosis of tuberculosis is definite.

These pulmonary conditions are among our most difficult to differentiate, but, with careful observation and not too great hurry, an exact diagnosis may usually be made. It seems to me that the clearest conception of tuberculosis is obtained by analyzing the cause of the signs and symptoms which are found on examination. The analysis of symptoms is also of the greatest aid in differential diagnosis. The constancy of the reflex muscle tension in the presence of pulmonary tuberculosis commends it as one of our most dependable symptoms, and, when we consider it along with symptoms belonging to the other groups, we have a very dependable basis for diagnosis, even in these borderline cases.

## TUBERCULOSIS CLINIC

DR. F. M. POTTENGER,
Monrovia, Calif.

Hotel Dieu, El Paso, Nov. 3, 1927.

(As a part of the program of the Clinical Congress of the Medical and Surgical Association of the Southwest, El Paso, Nov. 2 to 5, 1927).

The first two cases were used to study the significance of the history and symptoms, from the diagnostic standpoint. The other four cases were used to demonstrate physical findings, with some discussion as to treatment.

### CASE I.

Male, age about 35 years. Never sick until about the age of 13; then developed cough with profuse expectoration. Thought at the time to be tuberculosis, though sputum was negative. Chills and fever from the age of 13 on; lived in a malarial country. At the age of 17, he had what the doctors thought was abscess of lung. He had pain in the right lung which came on suddenly; in about a week the abscess burst with lots of sputum. He had fever for quite a while and lost some weight. He would cough up purulent mucus, then white foam. Finally this disappeared. He had typhoid fever at the age of 19. He had lobar pneumonia at 22, and a second attack of pneumonia at 30. Was sick only a week or ten days. Has never been well since last attack. When he works hard he develops fever. He is now ten pounds below normal weight. Has periodic spells of temperature with increased sputum, which is negative for tubercle bacilli.

This case is very interesting. The patient says he has coughed since childhood and thinks he inhaled a piece of grass when about twelve years of age. I am quite sure from his history that he is mistaken about this, because he would have had trouble immediately or within a very short time, and he did not cough until about a year later. He states that there was considerable odor to the sputum at the time of the lung abscess. Apparently the abscess discharged and healed, and is not the cause of his present symptoms. He states that if he stays in bed for a week his fever will be gone; then he can go back to work for two or three days and he has fever again. His cough is undoubtedly of the bronchiectatic type; it began about the age of thirteen, apparently starting with an acute cold or an acute infection. A cough which persists for that length of time is nearly always bronchiectatic. One cannot say that this condition may not become tuberculous, but I would say that it is, primarily, a non-tuberculous process. You can nearly always diagnose bronchiectasis by studying the history. It is apt to start from whooping cough, pneumonia or influenza—pneumonia or whooping cough particularly—with the cough persisting over a long period of time.

Ques. How do you treat bronchiectasis?

Ans. It is a most difficult thing to treat. A case of this type I treat much the same as tuberculosis. Emptying the bronchi twice daily is of the utmost importance, using a tilted table or the edge of the bed. By keeping the bronchi well emptied you take away a good deal of the tendency for the bronchiectatic condition to increase. I give these patients iodine over long periods of time.

Ques. How about compression?

Ans. It is not much good. This is not the type for compression. When such a condition is distinctly one-sided, it can be operated upon, and chest surgery has been fairly successful in some of these cases. Graham has devised a technic in which he makes a window posteriorly, brings the visceral pleura up and lets it become adherent; then he goes in and cauterizes out the diseased area. He has been fairly successful, but if the condition is double you cannot carry that out. These patients ought to be given a trial on intensive treatment, by emptying the bronchi twice daily, improvement of the general condition and building up their resistance so they do not take cold. Vaccine will help in many cases, but we must give the vaccine over long periods of time. I prefer autogenous vaccine. The injection of lipiodol has resulted in a good deal of disappointment, but a few cases have been helped very materially, so that it should be tried. Iodine in some form over long periods of time I think is the best remedy.

### CASE II.

Male, age about 35. Had pneumonia in November, 1918, and was in bed until January first, with temperature and cough all the time, but very little sputum. Normal weight was 144; weight in February after getting up was 118. Doctor said he had abscess of the lung. Reached normal weight in three months; went back to work and went to pieces, losing weight and coughing a great deal. Went to railroad hospital where they said he had tuberculosis. He came west. Was running temperature to 99.2, with quite a bit of sputum. Sputum was not examined until he came west, when tubercle bacilli were found. Has had hemorrhages of three or four ounces. Not much pleurisy. At the present time he has a little fever, possibly to 98.8 if he stays in bed. If he exercises, pulse and temperature go up. Appetite is good.

It seems strange to me that so many tuberculous patients come under my observation with the statement that they have never had sputum examined. I think the doctors in the east are not quite so keen on this as the doctors in the west. A slow recovery from pneumonia or influenza always makes us suspicious of tuberculosis. Lung abscess behaves in a different way, as in Case I. This finding of tuberculosis following pneumonia or a similar infection, can only be explained on the ground that the tubercle bacilli are dormant in these lungs, and are stirred up by such an infection as

influenza or pneumonia when the patient's resistance is lowered. When these acute infections come on, the immunity mechanism is interfered with for the time being, and the conditions are the same as they are when the bacilli are sowed on virgin soil,—ripe for the spreading of the disease. In this case, the history of pneumonia, then a slow recovery, and a residual condition which does not clear, points to a tuberculous process. The positive sputum, finally, definitely proved the diagnosis.

This patient's temperature is normal when he stays in bed; when he exercises, the pulse and temperature go up. One of the big problems in dealing with such cases is how to get them out of invalidism. Such patients need to be guided very carefully, and sometimes I disregard the general rule and put them on exercise. We hear the surgeons talk about technic, but there is just as much technic required in medicine as in surgery, but we do not seem to realize it. I do not tell such patients to go and walk so many minutes; I like the idea of distance, rather than time, as it is more accurate. If the patient has been an invalid for a long time, he cannot go from bed right back to work, or from no exercise at all to any kind of work. I start getting him up, say ten minutes a day; if everything goes right this is increased very gradually, until he is sitting up three hours a day. Then let him play around a few days before starting him walking. The first day he walks, he will go perhaps a hundred feet, and the distance is gradually increased. Do not let him overdo or he will fail; if he will keep within bounds he will succeed. If they will build up and get exercise slowly, they will eventually come out all right.

Contrary to general belief, tuberculosis does not always begin in the apices. It can be in any part of the lung; very often I find it in the second interspace and have seen a great many cases of tuberculosis in the lower lobes. These patients have their own x-rays on the outside of their chests, if the doctor knows how to interpret them. In this Case II, you would know that he has tuberculosis and that he has had the disease for many years, because of the amount of muscle degeneration, while Case I does not have degeneration, though his disease is of longer standing, and you would say that he is probably non-tuberculous.

CASE III.

Female, age about 25. Always in good health until August, 1926. Started with bad cold in throat, then in the head. Took treatment from nose and throat specialist. Was running a high temperature, but kept on working. Had no loss of weight, did not feel normal, did not sleep well, was nervous and general health declined. Cold persisted until about first of December, when she had a hemorrhage. Following this, cough continued, and sputum was positive for tubercle bacilli. Continued work until December 18th, when she went to bed.

This brief history illustrates the type of case in which the early symptoms were predominantly general and toxic. With few or no local signs, she had the general symptoms of toxemia, loss of strength, nervousness and general decline. The hemorrhage finally pointed the way to correct diagnosis.

In the observation of this patient, we recall that she is now above her normal weight, but although she has filled out quite well, there is still muscle degeneration on both sides. There is lessened motion of the left base as compared with the right. This is due to a reflex which comes from the upper five or six thoracic nerves along with the phrenic. If you have inflammation here, whether at the top or the bottom, impulses go back to the cord, and in the cord are distributed to the phrenic nerve that passes to the crura of the diaphragm in the costal portion. This stimulation causes contraction of the diaphragm and of the scaleni and sternomastoid muscles and you have fixation above and below. That will come early, before there has been pleurisy or involvement that will reduce the elasticity of the lung. That lessened motion is one of the important things to determine in examination of the chest. If you find lessened motion, feel the muscle above and see if there is increased tension. In testing muscle tension, be sure you have the room warm, as a cold room (as this one is) will cause the muscles to become tense. While this patient has filled out, we can see that there is loss of subcutaneous tissue on the right side above the second rib. There is degeneration on the left side also and it apparently goes a little bit lower. As she is above normal weight, it is easily seen that she has involvement of both lungs. Some of these cases will fill out entirely, but very rarely. There is lessened motion on the right side in front; that may be due to changes in the lung tissue itself rather than to reflex at this time. In palpating the muscles, palpate very lightly. In this case, the lesions have not entirely healed, because there is still muscle tension; the muscle comes back against the finger like the string of a bow. The same thing is present on the left, though the right shows more degeneration. Text books tell you that the right sided muscles are larger; that is not true except in people who use the arms a great deal. The levator anguli scapulae and the rhombodei are nearly always larger on the right, so that you will feel a fullness on

the right which is not necessarily abnormal. That is due to the fact that these muscles are in better tone, from use of the right arm. In this patient, there is some loss of tone in these muscles, probably due to degeneration.

The physical examination would indicate an old lesion because of the degenerations mentioned, and it is not yet healed because of the muscle tension. There is not much density in the lung, although there is some.

X-ray shows infiltration at the right apex and into the first and second interspaces on the right, with rather marked hilus densities. On the left there is slight degree of infiltration into the upper lobe, with pleural density over the apex.

CASE IV.

Young man, age about 30. Always in good health until fall of 1918, when he had a rather severe attack of influenza, but thinks he made a complete recovery. He had a severe cold in 1924 from which he made slow recovery. In August, 1925, he had a severe attack of left sided pleurisy, with night sweats, and suffered a general break-down in health from which he has not recovered. Developed cough at same time as pleurisy occurred. Diagnosis of tuberculosis confirmed by x-ray and sputum. Some time ago diagnosis of tuberculous laryngitis was made, and he has not been doing so well since. Has spent some time in sanitarium.

X-ray examination shows infiltration densities into the apices, with a very fine mottling throughout the upper lung field of each side. Fine fibrous striation and beading, with marked fibrous change about each lung hilum.

This patient's having lost weight makes some difference in the examination, as you cannot tell how much of the muscle change is due to loss of weight and how much to atrophy, but even with the loss of weight in mind, we can see that there has been a marked degeneration of the subcutaneous tissue. There is much difference in the breathing, the right base moving considerably less than the left. When you compare the physical examination and the x-ray findings, do not try to make them agree, because they will not do it. Neither the x-ray nor the physical examination will find everything. Many men think that the x-ray film, because it visualizes, will show everything, but it does not. Have recently been doing some interesting work, which was original with me, though I find that it has been done long before. The usual x-ray of the chest is taken postero-anteriorly (front to the film), and I noticed that the discrepancies between x-ray findings and physical findings were usually on the posterior part of the chest. So I began to turn the patients around and have them rayed antero-posteriorly (back to the film). I found that the antero-posterior film, in those cases where most of the pathology was in the back, would show very differently from the postero-anterior film on the same patient. I found out, afterwards, that this fact had been pointed out in 1910, when some investigator took some tuberculous tissue, pasted it on the chest, and it would not show in the film, unless it was turned next to the film. If we want accuracy, it is better to take films both ways. In this patient's chest, you can feel a difference in the resistance; over the upper part there is more than below. While the x-ray does not indicate particular involvement of the pleura, there is some thickening that is quite characteristic. I would like to show an interesting thing. If you turn the patient's head to one side, as very many men do, the neck muscles pull up on the first and second ribs of the other side and fix them, so that you will get a higher percussion note on the side away from which the head is turned. That is what happens, many times, when one doctor finds dullness at one apex and another doctor finds just as much dullness at the other apex. There is only one correct way to percuss and that is to have the head directly forward. The same thing would happen behind, if the head were turned, but there is not the inclination to turn the head to the side, when examining behind. (Demonstrates difference in percussion note with the head turned and with it directly forward, showing how the pitch rises as the head is turned.)

CASE V.

Female, age 31 years. Childhood history negative until age of 12, when she had measles, mumps and whooping cough; pneumonia at 21. Before she recovered from this, she got inflammatory rheumatism and has never fully regained her strength. Family history negative. In January, 1921, small tumorous mass found in left supraclavicular region. She had recently been vaccinated, and thought it was some infection from vaccination. Grew gradually worse until March or April of the same year. Then she began to experience a sense of "clutching," tender to touch. Thought of goiter and consulted doctor who gave local applications without result. Nothing more done until August, 1921. Temperature usually went up a little in afternoon. About this time more glands became involved on both sides of neck, with a sense of pressure, also tenderness to pressure. In September, 1921, went to hospital for x-ray picture, and diagnosis of Hodgkin's disease was made. In October, x-ray treatments were commenced and she got some better. Biopsy was done and diagnosis confirmed pathologically. All laboratory tests negative. Size of glands decreased. Patient continued x-ray treatment at varying intervals for a period of four years. In spring of 1925 she developed sudden severe pain in right thigh radiating downward, similar to sciatic neuritis; pain

was sudden and very severe. It was also present in small of back; usually occurred in the night and lasted 3 to 5 hours. Temperature up very markedly, and usually chill before temperature. Attacks extremely irregular. Pain would subside when she began to sweat. X-ray treatments have apparently helped.

If there is anybody in the audience who knows anything about Hodgkin's disease, I wish he would take the stand. There is very little known about it. Several years ago, Yates of Milwaukee discovered a bacillus which he thought was the cause of Hodgkin's disease, but this has not been generally accepted. There may be a much closer relationship between Hodgkin's disease and tuberculosis than we now know. There is much about bacteria that we do not yet know. Contrary to former belief, streptococci do not always appear in chains. The tubercle bacillus is not always a long rod. Many years ago Spengler called attention to the "splitter" forms of tubercle bacilli, and there is no doubt that this bacillus takes many forms and sometimes a form that we are not able to stain. We know that the tubercle bacillus goes through a process of growth and that the younger forms are not as stainable as the older ones. So, there may be a closer relationship between Hodgkin's and tuberculosis than we think.

This patient has a general glandular involvement. On inquiry we find that the x-ray treatments were 180 k. v. for thirty minutes over each area, under which she improved. We can tell very quickly whether the condition in her chest is an inflammatory one or not; if it is inflammatory, we will have reactions in the muscles. We find a rather interesting thing in this chest. There is degeneration of the subcutaneous tissue above the second rib in the left, and there may be a little on the right also. That would indicate an inflammatory process which involves probably considerable lung tissue. As you go over the chest you can outline this mass that is shown on the x-ray film. It is not as dense as might be thought; the glands are not very large. There is no glandular enlargement of consequence at this time. The patient states that she feels fine, works about eight hours a day right along; has no pain in the chest at the present time. There is muscle tension present on both sides but not high grade like a tuberculous process.

Ques. Would the pleural reaction which sometimes follows radiation of the chest act upon the muscles like an inflammatory process? Ans. No.

Ques. What is your opinion of tuberculin therapy?

Ans. I would use tuberculin on this case, on a chance. I have used tuberculin since 1896. It is never going to be popular because of the fact that it requires that very close watch be kept on the patient and adds greatly to the burden of treatment. But it is scientifically correct in the treatment of tuberculosis.

CASE VI.

Boy, age 13. Chief complaint, loss of weight and strength. No cough. Enlargement of a gland in right side of neck. Usual diseases of childhood. Typhoid fever latter part of 1918. Influenza and pneumonia in 1925; sick about five weeks. Similar attacks in 1926, when he was sick about four weeks. After the typhoid in 1918, he was diagnosed tuberculous and advised to go on a ranch and regain his strength. He fell and broke his nose latter part of 1924. Tonsils removed in 1923. Teacher told him he was underweight.

With regard to the height and weight charts used by the schools; standards are useful only in a general way. How are you going to make a small boy, who has a small father, small mother and small grand-parents, fit a certain rule? And how are you going to have a large, rotund person do the same thing? You cannot do it.

Examination of this boy shows glandular involvement. The glands in the neck have been incised; the doctor says he got pus. Removal of one gland which is tuberculous does not do the patient much good. I would have this boy eat well, run around without his clothes on and get plenty of sun baths, sleep in the open, and live the life of a normal healthy boy. Let him go to school and be normal. Keep him out of competitive sports and too violent exercise, for a time at least. Treat these cases intelligently. There is no reason why this boy should not develop normally and grow into a strong man. We know this type of infection takes place in from forty to sixty per cent of people before they reach this boy's age. We know they heal completely without symptoms in about sixty per cent of the cases. We know in about forty per cent they do not heal completely and produce some slight symptoms, usually a slight toxemia. All you need to do in this case is build up the boy's resistance, have him sleep in the open, eat good food, take cold baths so he will resist colds, take sun baths, and not overlo during the period when there is suspicion of this condition. But DO NOT make an invalid out of him.

# LOCALIZATION OF FOREIGN BODIES IN OR ABOUT THE EYE

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Whenever an eye is injured by a foreign body, it immediately becomes of fital importance to determine (1) whether the globe was penetrated by the body and (2) whether the foreign body remained within the globe or passed through it. The proper management of such injuries depends upon the early and accurate determination of these points. Sometimes examination with the ophthalmoscope will give the necessary information, but usually a penetrating wound of the globe will so cloud the transparent fluids and structures of the eye that ophthalmoscopic examination is not satisfactory. Therefore, following the discovery of the x-ray, the advantages of determining the presence of a foreign body by radiography, and its accurate localization, were quickly recognized, and the work in this field was one of the earliest developments in clinical radiology.

The first recorded localization of a foreign body in the eye is said to have been the one made by Dr. Francis H. Williams and Dr. Charles H. Williams, of Boston, on June 5, 1896, reported by Dr. Charles H. Williams, in the Boston Medical and Surgical Journal of August 13, 1896, the x-ray work being done at the Rogers Laboratory of Physics of the Massachusetts Institute of Technology.

Dr. W. M. Sweet, of Philadelphia, reported localization by his method in the Archives of Ophthalmology of November 27, 1898. Dr. Charles F. Bowen, of Columbus, Ohio, also reported his method of localization about the same time.

Since the perfection of localization technic, ophthalmologists have been placed in a position of decided advantage in handling foreign body injuries of the eye. The ability to determine definitely the location of the foreign body, its size, shape and, within limits, its nature, permits the proper treatment of such injuries to be given early and has conserved the vision of many eyes which would, otherwise, have been lost.

Among the writers on this subject, from the radiologic standpoint, during recent years, may be mentioned the following:

John S. Derr, in the American Journal of Roentgenology, August, 1916, emphasized the value of x-ray in determining the presence of foreign bodies and the ability to recognize very small foreign bodies. He described the old Sweet apparatus and reported sixteen cases of localization.

James G. Van Zwaluwenburg, in the American Journal of Roentgenology, for October, 1917, emphasized the necessity of fixation of the head and globe, and discussed various sources of error and their avoidance.

Ancil Martin and W. W. Watkins, in Southwestern Medicine, for November, 1919, discussed the value of radiography, and the varying density of different substances encountered as foreign bodies, reporting twelve selected cases.

M. B. Titterington, in the Journal of Radiology, for January, 1920, described in detail methods with the Sweet-Bowen localizer, and also with the improved Sweet localizer. Emphasis was laid on the necessity for complete fixation of the globe. Films should be checked against each other, and if there is a variation, a new set should be made.

James M. Patton, in the Journal of the American Medical Association, Sept. 23, 1922, writing on the "Localization and Extraction of Intra-ocular Foreign Bodies," emphasized that in every eye injury the possibility of intra-ocular foreign body should be considered. The eye seems to tolerate copper or brass more kindly than other non-magnetic substances. The x-ray is the most valuable aid in diagnosing and locating foreign bodies in the eye.

The technic of localization with the Sweet localizer has been described by several writers, especially by Titterington, and will not be repeated here. We wish to emphasize, along with the writers mentioned, the necessity for scrupulous exactness in technic. In many cases, however, exact technic becomes impossible on account of the nature of the injury. When both eyes are injured and photophobia is present, it may be impossible to secure fixation of vision on the mirror. Even when only one eye is injured, fixation of vision with the good eye may not prevent nystagmus or involuntary movement in the injured eye. When fluid has been lost from the eye, the cornea may collapse or the globe shrink so that the charted measurements become inaccurate for the eye under examination. The globe may be displaced by hemorrhage into the orbit, by edema around the eye, or bony injuries to the orbit, so that the charted localizations are uncertain.

These and many other factors make lo-

calization difficult and uncertain in some cases. In spite of these sources of error, however, localization by the Sweet apparatus is remarkably accurate and can usually be taken as a reliable guide in handling foreign bodies in or about the eye. Even in those cases where there are multiple small foreign bodies, as after a blast or other explosion into the face, usually the particles within the globe area can be selected and localized with respect to the eye. In such cases, the errors are such as are inherent in the nature of the foreign particles, since tiny particles of hard dirt or some kinds or rock cast hardly any shadow and are sometimes not visible on the radiograph.

In the analysis of any large group of cases, the value of localization soon becomes apparent, and certain kinds of injury become impressive by their recurrence. In 500 consecutive examinations of eyes for suspected foreign body, made by us from Jan. 1, 1918, to July 1, 1926, we have localized foreign bodies within or about the eye in 146 patients.

The large number of cases giving negative results illustrate how important this examination is regarded by the ophthalmologists for whom we work. The eye specialists of Arizona who handle industrial work have every eye injury radiographed, there being about three reported negative as to

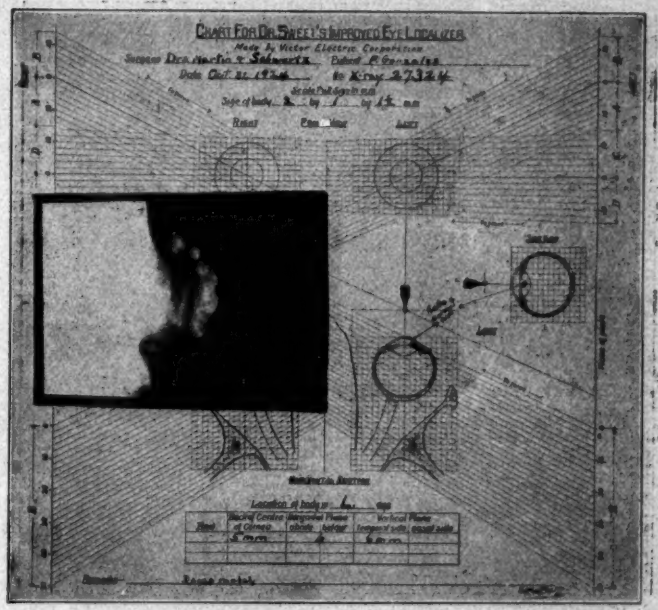


Fig. 1. F. G., injured Oct. 9, 1924, examined Oct. 30; complained of loss of vision and photophobia; no pain; cornea clear, without evidence of wound. Anterior chamber normal in depth; lens clear; in the iridocorneal angle of temporal side, slight bulging of iris and inflammatory changes; fundus normal. X-ray showed a totally dense foreign body 2x1x1½ mm., in ciliary region, temporal side, 5 mm. back of cornea, 6 mm. to temporal side and in vertical plane. This corresponded to the bulging mentioned. On Nov. 9, foreign body extracted by giant magnet, anterior route; body became entangled in iris and iridectomy was done, foreign body being drawn through this opening. On Nov. 28, vision was 15/70 plus and eye quiet. On Feb. 10, 1925, vision was 15/50. **Comment.**—History indicated that eye was struck by rock. There was no visible wound of entrance when examined by ophthalmologist, yet there was a fairly large foreign body, which proved to be iron. Illustrates the necessity for x-ray examination in every injury to the eye.

In the analysis of any large group of cases, the value of localization soon becomes apparent, and certain kinds of injury become impressive by their recurrence. In 500 consecutive examinations of eyes for foreign body to one in which we need to localize. There is submitted herewith a tabulation showing the interesting features of the 146 cases upon whom localization was necessary. Supplementary to this, we wish to outline briefly several classes of injury in which radiography is especially valuable, with one or two typical illustrative cases in each class. Other instances of each of these groups will be found in the tabulation.

1. In some injuries there is demonstrable

intra-ocular damage but foreign body is not found in or about the globe.

**Example:** Ser. No. 108—J. T., on Oct. 25, 1925, was breaking rock with a hammer when something flew into his left eye. Examination in afternoon of same day showed incised wound of lower lid; also an incised wound extending from the limbus margin into the cornea and into the anterior chamber; through this opening the iris had prolapsed. X-ray (our No. 27,261) showed no shadow of foreign body localizing within the globe area. Prolapsed iris was amputated, and recovery was satisfactory, vision on November 10 being 15/15 with correction.

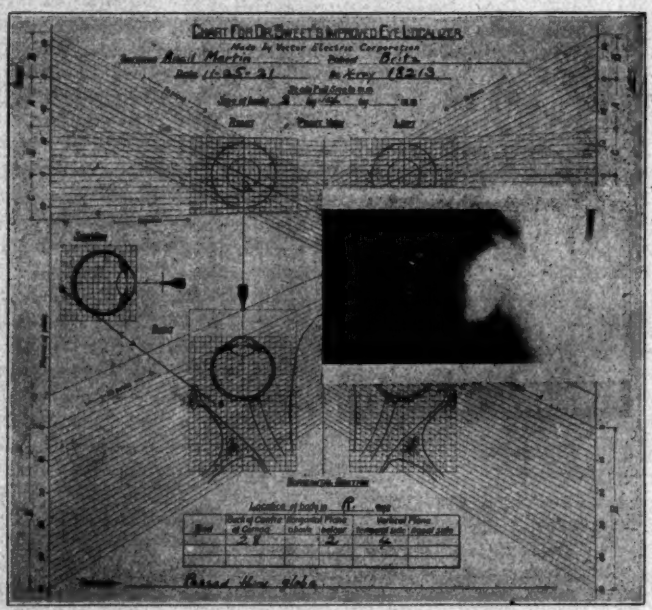

Fig. 2. J. B., injured April 2, 1917. Right eye became red and painful, with objects blurred. On April 3 there was marked ciliary injection, with clear cornea and lens, though vitreous was filled with blood clots. There was wound of bulbar conjunctiva and underlying sclera 6 mm. to temporal side of limbus in horizontal plane. Application of magnet gave no result. X-ray on April 3, by Dr. W. H. Sargent, showed the foreign particle posterior to the globe, in the same location as subsequently found by us. No further attempt at removal. On July 20, eye was quiet, no redness, lens clear, large mass of floating shreds in vitreous. Vision 7/200. On Oct. 25, 1921, x-ray showed foreign body, measuring 4x2x2 mm., lying posterior to the globe, 28 mm. back of cornea, 2 mm. below horizontal plane, and 4 mm. to temporal side of vertical plane. Eye was quiet; vision—light perception. **Comment.**—Illustrates value of localization before attempting extraction. Magnet in this case did no harm, but in some cases magnetic pull might be harmful. After ascertaining the location of this fragment, it was plain that extraction was not indicated.

2. With surprising frequency, cases present in which very careful search has failed to reveal any wound of entrance, and yet foreign body is localized in the globe by x-ray. This is more likely to happen when the injury is old, but may occur even when the injury is quite recent.

**Example (Fig. 1):** Ser. No. 109—On Oct. 9, 1924, while the patient was breaking rock with a hammer, a foreign body, supposedly rock, struck his left eye. When examined in Phoenix on October 30, there was lachrymation and photophobia, but no pain; complained of loss of vision. Cornea was clear and there was no visible wound of entrance; anterior chamber was normal in depth, with fine pin-points of uveal pigment visible; balance of lens clear. In the irido-corneal angle of the temporal side there was a slight bulging of iris and evidence of inflammatory changes. Fundus was normal.

X-ray showed foreign body (No. 27,324) 2x1x1½ mm. of total density (metal) localizing in the ciliary area of the temporal side, in the spot corresponding with the bulging mentioned.

This was extracted on November 9, by giant magnet, anterior route. Foreign body became entangled in iris and iridectomy was done, the particle being drawn through this opening. On Feb. 10, 1925, vision was 15/15.

3. The foreign body may have passed through the globe, and the intra-ocular structures be so disturbed that ophthalmoscopic examination is of little value. In such cases, localization may prevent needless and sometimes injurious attempts to find the body or remove it.

**Example (Fig. 2):** Ser. No. 59—J. B., on April 2, 1917, while at work as boiler-maker, was struck in

the right eye by a piece of chipping. On April 3, there was marked ciliary injection, with clear cornea and lens, though vitreous was filled with blood clots. There was wound of bulbar conjunctiva and the underlying sclera, 6 mm. to temporal side of limbus in horizontal plane. Application of magnet did not bring foreign body into view, and localization by Dr. William H. Sargent showed the foreign body to be posterior to the globe in the same location subsequently found by us. No further attempt at removal was made and on July 20 eye was quiet and vision 7/200.

On Oct. 25, 1921, he was re-examined by us (18,213), localizing foreign body, 4x2x2 mm., lying posterior to the globe. Eye was quiet with light perception. It is probable that application of magnet did no harm in this case, but after localization it was evident that removal was not indicated and its attempt would be futile.

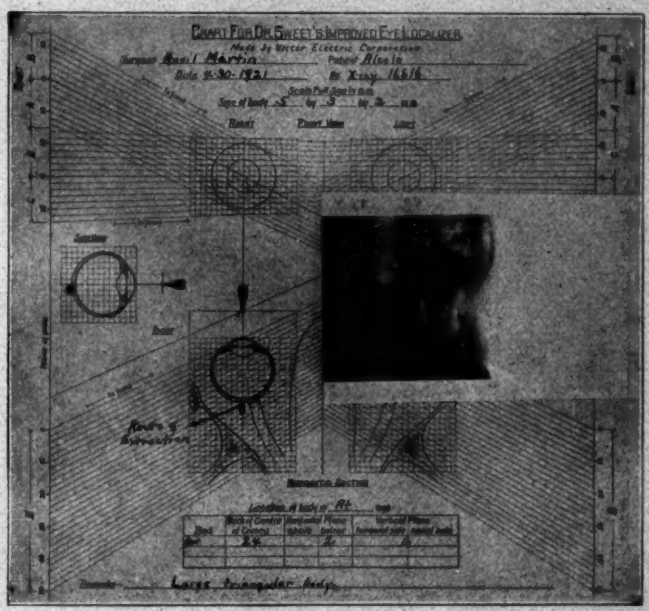


Fig. 3. O. A., injured April 28, 1921. Large central corneal wound in right eye, with swollen and flocculent lens; pupil irregular in size; tension minus. X-ray showed a large foreign body, 5x2x3 mm. in size, located just posterior to the globe, in the vertical plane, and just below the horizontal plane, having the density of heavy metal. Wound of exit evidently between macular region and nerve disc and may have injured both. Through a canthotomy opening into orbit on temporal side, foreign body was extracted with magnet. Patient discharged May 17 with eye quiet, tension normal, traumatic cataract. Light perception present. **Comment.**—Accurate localization of this foreign body permitted its removal without further injury to the eye.

**Example (Fig. 3):** Ser. No. 54—O. A., on Oct. 28, 1921, while using cold chisel on steel, was struck in right eye by flying particle. Corneal wound central and very large; lens flocculent and swollen; pupil irregular in size; tension minus.

X-ray (16,616) showed a large foreign body, 5x2x2 mm., located just posterior to the globe in the vertical, and just below the horizontal, plane.

This foreign body having evidently passed through the globe, a canthotomy opening was made in the temporal margin of the orbit and foreign body pulled through this with magnet. Patient was discharged on May 17, with eye quiet, traumatic cataract, but with light perception.

4. In cases of non-magnetic foreign bodies, like copper or rock, it is very essential to know whether there are intra-ocular particles, as the indications for enucleation or conservative treatment may depend on this information.

**Example:** Ser. No. 135—C. C., miner, age 13, struck a blasting cap with pick on Dec. 22, 1925, receiving wound in right eye. Examined on December 26. Lens opaque; wound in center of cornea, with wound through lens. Minute particles of copper in depths of corneal tissue.

X-ray (33,072) showed a foreign body about 2 mm. square in the vitreous chamber; particle was too dense for rock and was probably copper.

Eye continued to be inflamed and, with knowledge that it contained copper, enucleation was done on Jan. 2, 1926. An irregular piece of copper was found in the vitreous surrounded by a green-stained focus of pus.

5. Where multiple foreign bodies have been blown into or about the eye, as after a blast, the treatment is usually guided by the presence or absence of intra-ocular particles in one or both eyes.

**Example:** Ser. No. 81—T. J., on July 9, 1923, picked into missed hole and received blast in face. When seen on July 12 he had extensive laceration of each cornea and numerous foreign bodies in the

substance of the cornea. Traumatic cataract in each eye.

(Note: Left eye was apparently the least injured, but the presence or absence of foreign bodies within the globe would determine the treatment.)

Radiographs of each eye area (22,922) showed numerous foreign bodies about each orbit. Two particles definitely localized within the vitreous chamber of the right eye, but no particles were localized within the left globe (5a).

Right eye was subsequently enucleated, chiefly to avoid sympathetic irritation of the left eye. Traumatic cataract was removed from the left eye, the visual impairment in this eye being due to corneal scars which limited vision to the perception of large objects nearby.

41. On July 3, 1923, while holding bar for driller, something flew into left eye. When examined four days later, there was a perforating wound of inferior portion of left cornea, with prolapsed iris, hemorrhage into anterior chamber, and large clot in the vitreous.

X-ray (22,896) showed a large foreign body, 4x3 mm., in the vitreous chamber, above and to nasal side of lens.

In view of the location and size of the particle, a new scleral opening was made, 6 mm. posterior to the limbus in the superior nasal quadrant, and foreign body was drawn through this with magnet. The inflammatory disturbance gradually subsided and eye became quiet, with light perception present.

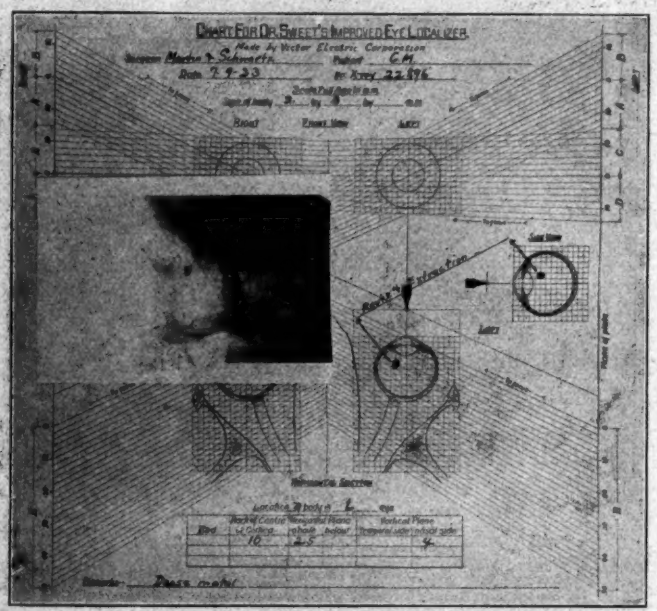


Fig. 4. C. M., injured July 3, 1923. Examination of left eye showed perforating wound of inferior portion of left cornea, with prolapsed iris. Hemorrhage into anterior chamber and pupil displaced downward. Large clot in vitreous. X-ray showed a triangular shaped foreign body 4x4x3 mm. in vitreous chamber, 12 mm. back of center of cornea, 4 mm. above horizontal, and 3 mm. to nasal side of vertical planes. Density of heavy metal. Scleral opening was made 6 mm. posterior to the limbus in the superior nasal quadrant, L-shaped, and foreign body extracted by giant magnet. Inflammatory disturbance gradually subsided and eye became quiet but with light perception only. **Comment.**—Localization, by showing the size, shape, and location of this particle, guided surgeon in making posterior extraction through a new opening, thereby avoiding further intra-ocular injury.

**6. The determination of the exact size, location, and shape of foreign bodies by x-ray frequently furnishes the necessary indication for the route of extraction of magnetic foreign bodies, or suggests the possibility of extraction by forceps of non-magnetic bodies. This improvement in technic has permitted the conservation of the eye or the vision in many instances where, without this guidance, the eye would have been totally lost.**

**Example (Fig. 4):** Ser. No. 80—C. M., miner, age

**Example:** Ser. No. 103—W. J. M. On June 22, 1924, while chipping on a brass plug, something struck him in the right eye. Examined June 26; perforating wound of sclera on nasal side about 1½ mm. from limbus. Anterior chamber normal; lens cloudy; hemorrhage into vitreous; fundus not visible; vision, fingers at four feet.

X-ray (26,240) shows a large dense foreign body, measuring 9x9 mm., in the vitreous, with one end close to the inferior temporal scleral wall.

With this guidance, an incision was made through the sclera over the end of the foreign body. Application of magnet proved it to be non-magnetic, and it was grasped with forceps and extracted. It proved to be a piece of brass, measuring 9x9x2

mm. Eye quieted down; on August 14 patient was discharged with vision of hand movements at one foot; lens and cornea were clear, the loss in vision being due to vitreous opacities. On September 9, there was noticeable improvement in vision.

7. When foreign bodies change position, either unassisted, or after application of magnet, it is frequently very desirable to determine this by re-localization

**Example (a):** Ser. No. 96—P. M., miner, age 41. On Jan. 30, 1924 while working on cement floor, was struck by flying particle in left eye. Examination showed a linear wound in nasal limbus, 2 mm. in length. Eye was irritable, lens opaque and photophobia present.

X-ray (24,616) showed a foreign body 2x1 mm., in the vitreous chamber against the posterior scleral wall. Density was that of metal.

Magnet was applied on February 1, which produced pain; foreign body did not appear in the anterior chamber, so that it became desirable to know whether it was dislodged. Re-examination showed the foreign body had been drawn directly forward and was now at the lower internal angle of lens. It was then pulled through the suspensory ligament into the anterior chamber and extracted through wound of entrance.

**Example (b):** Ser. No. 121—Interesting, but of less practical importance, is an instance of a mobile non-magnetic foreign body. Patient was struck in right eye March 15, 1925, by piece of rock. First examining physician said that he could see it in the anterior chamber. Ophthalmologist could not see it, and x-ray examination (29,154) localized it in the posterior chamber, on the nasal side, it apparently having fallen through the pupil into the posterior chamber. On June 15, x-ray examination showed the particle to be in the anterior chamber on the temporal side.

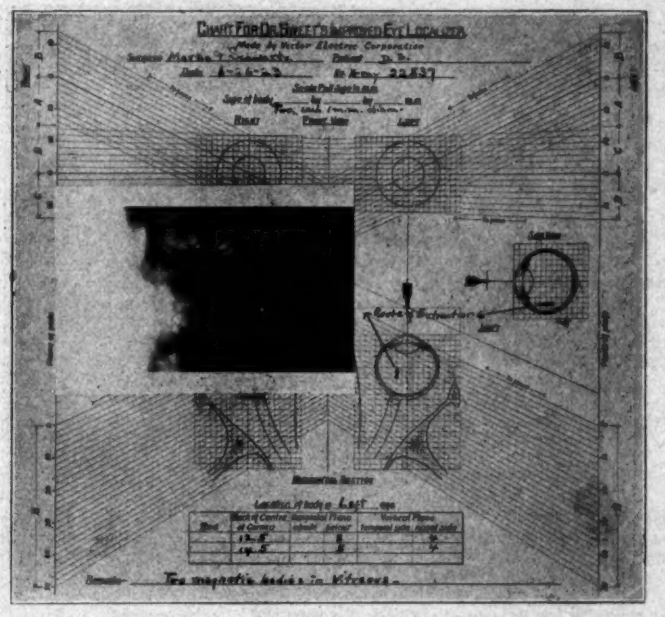

Fig. 5. D. S., aged 12, injured June 20, 1923. Examination of left eye four days later showed wound at upper margin of cornea; lens swollen and opaque; anterior chamber shallow. X-ray showed two foreign bodies of about the same size and density, in the vitreous chamber, 13 and 15 mm. back of cornea, 8 mm. below horizontal and 4 mm. to nasal side of vertical plane. They were of the density of heavy metal and lay close together without visible union between them. The two particles were extracted by the posterior route, through a new scleral opening; they came together, but dropped apart when magnet's attraction was removed. **Comment.**—Two magnetic foreign bodies in the same eye is an unusual finding, but is another illustration of the necessity for x-ray localization. The indications for extraction by the posterior route were also furnished by the x-ray findings.

Being a small foreign body and non-magnetic, and the eye being quiet with good vision, no attempt at extraction was made.

8. It is frequently possible to give a fairly reliable opinion as to whether a foreign body is metal or rock. For example, in the case described under Example (a), above, in which the patient was chipping on cement, from the density of particle it could almost certainly be placed in the class of heavy metals.

9. Cases of more than one magnetic foreign body are encountered. It is possible to extract one of these and leave others, if localization is not used.

**Example (a):** Ser. No. 132—M. I., was struck in right eye by piece of flying steel on Sept. 27, 1925. One piece of steel was removed by physician in Nacozari, Mexico. Examination in Phoenix on Oct. 23, 1925 (No. 32,044) showed a small particle in the anterior portion of lens; this was removed by giant magnet.

**Example (b)** (Fig. 5): Ser. No. 79—D. S., on June 20, 1923, while chiseling out a rivet, felt something strike him in left eye. There was a single wound at upper margin of cornea, with lens swollen and opaque; anterior chamber shallow.

X-ray (22,837) showed two foreign particles, about the same size, one directly behind the other, in the lower portion of vitreous.

New opening was made in the sclera in the inferior temporal quadrant, and magnet applied. Both particles came out together.

10. Extraordinarily large foreign bodies can frequently be removed without additional trauma, when the size, shape, and best route for extraction are indicated by x-ray.

**Example** (Fig. 6): Ser. No. 16—Patient was struck in right eye by piece from head of bolt on March 17, 1919. Cornea, lens, and anterior chamber not injured. Injury to floor of vitreous. X-ray examination (No. 8,751) showed very large, thin foreign body, more than half an inch long and quarter of an inch wide, shown projecting into the floor of the vitreous. By pulling directly back with the magnet, it was removed without additional trauma, and with preservation of the globe and partial vision.

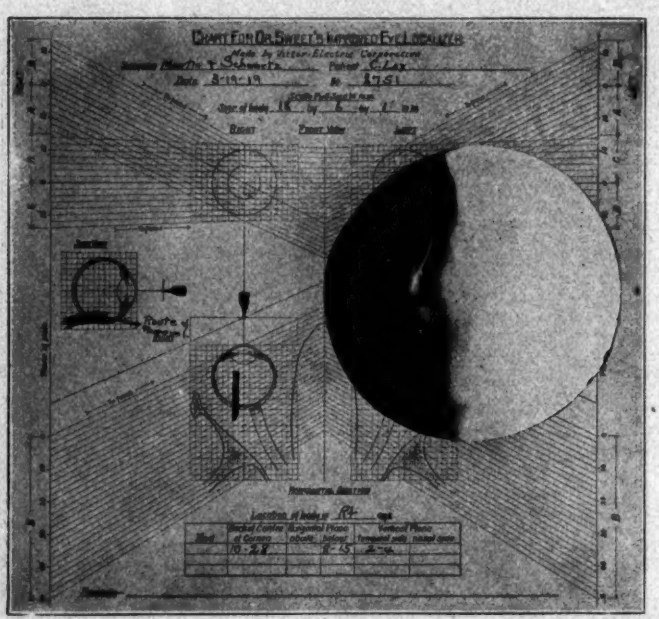

Fig. 6. C. L., injured in right eye March 17, 1919. Incised wound of lower lid, with soft tissues edematous; cornea and anterior chamber uninjured; lens clear; fundus clear in upper portion; large dark mass in floor of vitreous; vision in lower field only. X-ray showed a very large, thin foreign body localizing part way within the vitreous chamber and protruding posteriorly beyond the globe. By giant magnet, this was drawn back through wound of entrance. On April 7 he was discharged with eye of good appearance and with vision of fingers at three feet. **Comment.**—It is extraordinary to have so large a foreign body penetrat the globe and yet to preserve the globe after its removal. It was very thin and its shape and position, as shown by the localization, enabled the surgeon to withdraw it with the magnet with a minimum of trauma.

In summarizing this review of our work with foreign bodies in the eye, we would conclude that accurate localization of such particles is not only desirable, as so conservatively stated in most papers on this subject, but is so necessary to the intelligent management of most injuries of this type that the procedure cannot safely be omitted in any foreign body injury to the eye.

TABULATION OF FOREIGN BODY LOCALIZATIONS IN THE EYE

| Ser. No. | Date and X-ray No. | History and Injury | Localization | Treatment and Result |
|---|---|---|---|---|
| 1 | 1-11-18 (5,230) | Oper. mch. drill; left eye wound, lower cornea. | F. b. 4x1 mm. in vitreous. | Not removed; vision permanently lost. M. and S. |
| 2 | 4-3-18 (6,251) | Injury month old from striking drill with hammer. | F. b. in vitreous. | Magnet extraction of flake 1x½ mm. in diam. Vision 15/50; will grow less. M. and S. |
| 3 | 8-13-18 (7,288) | Chip from mch. drill in L. eye; wound temporal limbus. | Large f. b. in vitreous. | Magnet extraction; hypopyon; enucleation. M. and S. |
| 4 | 10-1-18 (7,557) | "Dust" fell in L. eye; incised wound inf. nasal limbus. | F. b. in vit.; density of metal. | Magnet extraction, ant. route; iridectomy; L. P. only account traumatic cataract. M. and S. |
| 5 | 10-3-18 (7,586) | Hammering pipe; small perforating wound of cornea. | F. b. below and to temp. side of globe. | Not removed; dense lens opacity; vision 6/60. Evidently passed through eye. D. F. H. |
| 6 | 10-10-18 (7,656) | Chiseling; struck L eye; wound to nasal side of cornea. | F. b. 3x2 mm. in vitreous. | Magnet extraction through wound of entrance; infection; enucleation. M. and S. |
| 7 | 10-11-18 (7,697) | Using drill; rock in eye 9 days before examination. | F. b. 3x2 mm., apparently in the vitreous. | Panophthalmitis; enucleation. Body in vitreous. D. F. H. |
| 8 | 11-11-18 (7,944) | No record obtainable. | In vitreous to temp. side against scleral wall. | No record obtainable. R. R. B. |
| 9 | 11-23-18 (7,998) | Struck on side of head; no recent eye injury; blind in R. eye. | Large f. b. 2x5 mm. behind and below globe. | No treatment; evidently old injury as shown by intraocular changes. M. and S. |
| 10 | 1-10-19 (8,247) | Hammering, 28 days before; struck in R. eye; no def. scar of entrance. | F. b. 2x1x1 mm. in vit hind, to nasal side of lens. | Magnet removal ant. route; lens opacity; vision 15/40 with correction. M. and S. |
| 11 | 1-20-19 (8,302) | Dyn. cap explosion; perfor. wound of cornea and lens. | Small f. b. 1x1 mm. far back in vit. | Enucleation 4 days after injury; copper found, with pus focus surrounding. M. and S. |
| 12 | 2-12-19 (8,494) | Injured 7-3-18; drill; no wound of globe seen; vis. now failing. | F. by 2x1x1 mm. in vitreous, to temp. side. | Magnet removal post. route; vision 15/20 with correction on 2/25. M. and S. |
| 13 | 2-18-19 (8,534) | Corneal injury by f. b. Lateral film showed shadow over orbit. | F. b. shown by localization to be external to globe. | Corneal ulcer healed; eye became quiet. F. b. not molested. M. and S. |
| 14 | 2-28-19 (8,598) | Blasting cap injury to both eyes; only R. has vision. | F. b. in R. vit. L. eye not exam. | L. eye enucleated; R. eye has tubular vision; prognosis uncertain account f. b. in it. M. and S. |
| 15 | 2-28-19 (8,599) | Inj. 12-9-18 by cap explosion; no visible wound of entrance. | F. b. in vit.; movable; varies position. | Not removed; eye quieted; vision 15/100 when last seen. M. and S. |

TABULATION OF FOREIGN BODY LOCALIZATIONS IN THE EYE—Continued

| Ser. No. | Date and X-ray No. | History and Injury | Localization | Treatment and Result |
|---|---|---|---|---|
| 16 | 3-19-19 (8,751) | Piece from head of bolt struck R. eye, lower edge of sclera. | Large thin f. b. partly through floor of vitreous. | Magnet extraction; eye of good appearance; vision L. P. only. M. and S. |
| 17 | 4-8-19 (8,887) | Piece of rock in eye 2 mos. before; no vision; wound sup.-int. quad. | Small f. b. of low density in vit. | Other eye was irritable and enucleation was performed; rock found. M. and S. |
| 18 | 5-5-19 (9,302) | Inj. 3-3-19; drilling; R. eye inj. Eye painful and no vision on 5-5-19. | F. b. (rock?) in temp. side of eye; none within eye. | By June 30, eye was quiet but cornea was cloudy and little vision; old injury. M. and S. |
| 19 | 6-12-19 (9,469) | Old inj. (in 1917); recent injury left no visible signs in eye. | Very small f. b. in vitreous. | Intra-ocular evidence of old injury; f. b. not molested; of medico-legal interest. M. and S. |
| 20 | 6-13-19 (9,485) | Inj. 2 yrs. before while idgging; corneal scar, intra-ocular changes. | F. b. 2½x1 mm. to nasal side of eye. | Magnet applied; no impulse. F. b. not recovered; vision 4/200. M. and S. |
| 21 | 6-23-19 (9,554) | Steel in R. eye; wound at upper temp. limbus; lens cloudy. | F. b. 7x1x¼ mm. in R. vitreous. | Magnet removed by ant. route; hemorrhage; no vision; enucleation advised. M. and S. |
| 22 | 7-4-19 (9,647) | Dyn. cap explosion; lens opacities; fundus normal. | Two small particles in right vitreous. | F. b. not removed. Vision 20/50. J. J. M. |
| 23 | 8-15-19 (9,908) | Flying steel in R. eye; wound through cornea; lens cloudy. | F. b. 3x2x2 mm. just behind lens in vitreous. | Magnet removal; infection followed and eye was enucleated. M. and S. |
| 24 | 9-3-19 (9,999) | Hammering board; f. b. in L. eye; small wound at temp. limbus; lens cl. | F. b. 3x2x1 mm. in vitreous, far back. | Extracted by magnet, ant. route; later became irritable and was enucleated. M. and S. |
| 25 | 9-22-19 (10,148) | Scleral wound; lens and cornea clear. | 4x4x3 mm. f. b. in vitreous. | Magnet extract. through wound of entrance; much intra-ocular injury; L. P. only. M. and S. |
| 26 | 9-25-19 (10,197) | Explosion. | F. bs. about each eye; 2 localize inside .R globe. | Enucleation of R. eye. E. C. B. |
| 27 | 9-27-19 (10,200) | Blast; extensive injury to both eyes. | F. bs. in each eye. | Eyes destroyed; no sight. M. and S. |
| 28 | 10-13-19 (10,337) | Cap explosion; incised wound across cornea; lens extruded. | F. b. 2x1 mm., probably copper, in vitreous. | Enucleated; copper found as localized, in pus focus in vitreous. M. and S. |
| 29 | 10-17-19 (10,375) | Shot in face; no visible wound of globe; blood in vitreous. | Shot size f. b. behind globe near optic nerve. | Shot not molested; no L. P. Probably injury to nerve. M. and S. |
| 30 | 11-14-19 (10,638) | Cap explosion; large wound in temp. side of cornea; f. bs. seen in ant. chamber. | No definite shadow of f. b. shown by x-ray. | Infection; enucleation; f. b. found in ant. chamber as noted; not shown by x-ray. M. and S. |

TABULATION OF FOREIGN BODY LOCALIZATIONS IN THE EYE—Continued

| Ser. No. | Date and X-ray No. | History and Injury | Localization | Treatment and Result |
|---|---|---|---|---|
| 31 | 11-28-19 (10,742) | Rock fell in eye; f. b. buried in cornea. | Shown on dental film beside eye. | Non-magnetic; not removed. iridectomy for old iritis. M. and S. |
| 32 | 12-23-19 (11,011) | L. eye struck; wound in sclera 7 mm. from temp. limbus | F. b. 4x3x3 mm. in vitreous. | Magnet removal through wound of entrance; mo. later no vision, detached retina; enucleation rec. |
| 33 | 1-5-20 (11,123) | Hammering; struck in R. eye; no wound of globe. | F. b. below and in front of globe. | Could be felt in margin of orbit; not molested. M. and S. |
| 34 | 1-6-20 (11,138) | Wound in R. eye region by bird shot. | Shot localized in orbit, near but not in the globe. | Not removed, as vision was not affected. V. M. |
| 35 | 1-9-20 (11,167) | Hammering on metal (1918); struck in eye; scotoma and vit. opacities. | Small f. b. not def. localized in globe. | No treatment recorded; not seen afterwards. M. and S. |
| 36 | 1-19-20 (11,672) | Blasted 1-1-20; ext. inj. to L. eye. | No f. b. localized in globe; one to temp. side. | Vision 15/200; R. eye 15/15. No surgical treatment, unless eye becomes irritable. M. and S. |
| 37 | 2-20-20 (11,676) | Picking in rock; L. eye struck; claims no prior injury; no wound. | Small f. b. (rock?) in lower part of vitreous. | Old intra-ocular changes; injury positvely not of recent occurrence. M. and S. |
| 38 | 3-22-20 (12,058) | 6 yrs. L. eye injury; 2 yrs. before, when hammering in steel. | F. b. in scleral wall of temp. side; 5x3 mm. | Removed with giant magnet; no visual disturbance. M. and S. |
| 39 | 4-8-20 (12,306) (12,350) | 2 mos. ago had f. b. in R. eye while grinding on emery wheel. | F. b. in ant. chamber; movable; two locations. | Removed by magnet, ant. route; lens was cloudy and was later extracted. M. and S. |
| 40 | 4-20-20 (12,481) | F. b. in R. eye 14 yrs. before; spots in front of eyes now. | Very small f. b. shown in globe; not definitely localized. | Spots not due to f. b. Vision normal. F. b. doing no harm and not molested. M. and S. |
| 41 | 5-29-20 (12,932) | Steel in R. eye 2 wks.; scleral wound on nasal side. | F. b. post. to globe in midline of orbit. | Not molested; vision lost account vitreous hemorrhage; F. b. went through globe. M. and S. |
| 42 | 6-1-20 (12,962) | Dyn. cap; extensive injury to each eye. | F. b. found in each globe. | F. bs. not removed; left eye total loss; L. P. in right. M. and S. |
| 43 | 6-9-20 (13,068) | Blasted in face; ext. injury to each eye. | One f. b. located in R. eye; none in left. | Corneal f. bs. removed and traumatic cataracts operated on; L. P. only account corneal opac. M. and S. |
| 44 M. and S. | 7-31-20 (13,625) | F. b. injury to each eye; cap explosion (?); R. eye injured more. | 2 f. b. in R. vit.; 1 f. b. against L. sclera. | R. eye enucleated 8-5-20. F. b. in L. sclera not molested. No eye disturbance up to 8/10. |
| 45 M. and S. | 10-7-20 (14,219) | Explosion; piece of rock seen in lens; more f. bs. in each cornea. | Particles not shown by x-ray. | L. P. only in R. eye; corneal particles removed; enucleation of R. eye advised. |

TABULATION OF FOREIGN BODY LOCALIZATION IN THE EYE—Continued

| Ser. No. | Date and X-ray No. | History and Injury | Localization | Treatment and Result |
|---|---|---|---|---|
| 46 M. and S. | 10-9-20 (14,249) | Dyn. explosion 6/10; linear scar across cornea of L. eye; much intra-ocular damage. | Many f. bs. about eye; none localized in globe. | R. eye had been removed; L. eye had L. P. only and was irritable; probably small f. b. particles in globe. |
| 47 M. and S. | 10-22-20 (14,429) | R. eye struck by steel which was buried deep in cornea. | Localization indicated ant. chbr. (error of 1 mm.). | Removed by giant magnet. No visual disturbance. Error due to edema of conjunctiva. |
| 48 M. and S. | 12-11-20 (14,982) | 4 wks. before, hammering on steel; L. eye injured; corneal scar. | Small dense f. b. behind center of cornea in vit. | Magnet extraction through inf. temp. opening in sclera; steel 2 mm. diam. Eye quiet; L. p. on 12-5-21, with cataract. |
| 49 M. and S. | 12-21-20 (15,062) | 2 mos. old injury to L. eye; scar ext. limbus; lens opaque. | Small f. b. lying against post. border of lens. | Magnet extraction, ant. route; cataract left; eye quiet. |
| 50 M. and S. | 12-22-20 (15,278) 12-11-23 (24,077) | Inj. 4 years before; rock (?) in R. eye; lens opaque; L. P. only; 2 exams., both same. | Each localization shows double shadow in vit.; has density of rock. | No treatment first exam. At second, magnet applied but no impulse; not disturbed further. |
| 51 M. and S. | 1-11-21 (15,058) | Blasted 12/23; many corneal f. bs.; both lenses clear. | Locates f. b. in each vitreous, besides corneal. | Many superficial corneal bodies removed; deep corneal bodies left 1/28, vision R. 15/20; L. 5/50; localization considered error. |
| 52 M. and S. | 1-14-21 (15,320) | Struck in R. eye by stick; corneal wound; lens opaque; vision nil. | Dense f. b. below and to nasal side of eye. | Has been mechanic; does not recall any accident to explain steel f. b. Not removed. |
| 53 M. and S. | 1-22-21 (15,478) | Rock in L. eye in 1919; eye quiet; lens cloudy. Sept., 1920, struck in R. eye with rock. | F. b., of low density, 1 mm. diam. in vitreous R. eye. | R. eye being best eye, nothing was done 8x20x22, eye becoming irritable and L. cataract was extracted. |
| 54 M. and S. | 5-2-21 (16,616) | R. eye struck by particle from cold chisel; large wound cornea. | F. b. 5x2x2 mm. in orbit posterior to globe. | Removed through canthotom opening by magnet, without disturbing eye. Eye preserved with L. P. |
| 55 M. and S. | 6-15-21 (17,012) | Blasted; many f. bs. in each cornea. | F. bs. in contact with globe. | Corneal f. bs. removed; vision good on R.; 2/200 on L. |
| 56 F. L. R. | 8-10-21 (17,393) | Working on car; wound over R. pupil; lens injury. | F. b. localized in vitreous. | Advised extraction with magnet; refused; patient not seen since. D. F. H. |
| 57 M. and S. | 8-16-21 (17,416) | Steel in L. eye 1908; one mo. particle in cornea removed. | F. b. 2x1 mm. in ciliary area lower edge. | Claims disability from recent slight injury; eye changes all old; not removed. |
| 58 M. and S. | 10-17-21 (17,855) | Blasted; many corneal f. bs. Perforation in center of L. cornea. | One f. b. in ant. chamber L. eye; none in R. globe. | Superficial f. bs. removed. F. b. not removed from L. eye; vision, O. D., 15/20; O. S., 15/50. |
| 59 M. and S. | 10-25-21 (18,213) | F. b. in R. eye in 1917 shown post. to globe; eye now quiet. | F. b. 3x1 mm. is just behind globe, temp. side. | Doing no damage; vision 7/200; not molested. |
| 60 M. and S. | 11-26-21 (18,219) | Blasted 4-13-21; bad injury to each eye with cataract. | Multiple f. bs.; one in left vitreous; R. side doubtful. | Treated elsewhere until sent for operation, for new pupil in R. eye. Rock in each eye. |

TABULATION OF FOREIGN BODY LOCALIZATION IN THE EYE—Continued

| Ser. No. | Date and X-ray No. | History and Injury | Localization | Treatment and Result |
|---|---|---|---|---|
| 61 M. and S. | 3-17-22 (19,128) | Blasted Oct,. 1921; many f. bs. removed from cornea. | Innacurate on account inability to fix vision. | Corneal f. bs. removed; one f. b. from iris; cataract removed from L. eye. |
| 62 J. J. M. | 6-16-22 (19,817) | Dyn. cap explosion; perforated iris and traumatic cataract. | F. b. not localized in globe. | Needled cataract 7/15: 3 mos. later reported by mail vision normal. |
| 63 M. and S. | 6-30-22 (19,913) | 3 yrs. before gun shell exploded near him; R. eye now blind (8 yrs.). | Very small f. b. localizes in vit. of R. eye. | Eye quiet; vision, hand movements only. No treatment. |
| 64 M. and S. | 7-8-22 (19,945) | After dancing had pain in eye; no visible injury to eyes. | 2 f. b., one localizing in R. vit., far back. | No record of treatment. |
| 65 M. and S. | 7-25-22 (20,032) | Explosion; multiple injury to eye. | No f. b. in globe; several in area. | Corneal f. bs. removed; vision fair in each eye. |
| 66 M. and S. | 8-22-22 (20,182) | F. b. in R. eye in auto race; 1 mo. before; corneal scar; L. P. only. | Very small dense f. b. in vitreous of R. eye. | Eye quiet; cataract; vision, fingers at one foot; treatment refused. |
| 67 D. F. H. | 9-11-22 (20,299) | Drilling; f. b. struck R. eye; lens disl. into ant. chamber. | 1x1½ f. b. in vit., lower segment, to nasal side. | Magnet tried; not successful; eye enucleated and f. b. found as indicated. |
| 68 M. and S. | 10-5-22 (20,472) | Drilling; f. b. in L. eye; entrance through lower edge of pupil. | Dense f. b. 5x1 mm. in vitreous of L. eye. | F. b. removed through scleral opening with magnet; 11-13-23, eye quiet; cataract; L. P. |
| 69 G. M. B. | 11-4-22 (20,759) | Shotgun accident, wounds about eye. | No shot localized in globe; one in floor of orbit. | Not molested. |
| 70 M. and S. | 11-17-22 (20,833) | Drilling; thought was struck by rock R. eye: small corneal wound and lens opacity. | F. b. 1 mm. diam. against sclera in vitreous of R. eye; metallic density. | Could be seen with scope: drawn through zonula with magnet and extracted ant. route; cataract reduces vision |
| 71 H. L. G. | 11-24-22 (20,906) | Injury some time in past. | Shadow in R. orbit which does not localize in globe. | Medico-legal question of localization of this shadow, reported as being in eye. |
| 72 M. and S. | 1-25-23 (21,576) | Blasted 1/10; many f. bs. in cornea of each. | Probably 1 f. b. in R. sclera; others near by. | Many f. bs. left in cornea of each eye; R. eye irritable; may have f. b. in globe. |
| 73 M. and S. | 2-16-23 (21,613) | Putting in stull; f. b. in L. eye; large corneal wound nasal seg. | F. b. 5x3 mm. in ciliary region temp. side L. eye. | Removed through wound of entrance by magnet; infection resulted; enucleation 2-20-23. |
| 74 M. and S. | 2-20-23 (21,653) | Blasted; both corneae filled with rock. | At least 1 f. b. (rock?) in each globe; many near. | R. eye destroyed; after enlarging and clearing pupil on L. vis. 6/100 on 12-5-24. |
| 75 M. and S. | 2-23-23 (21,686) | Hammer on steel; L. eye injury; small wound nasal side of cornea. | Long narrow f. b. post. to globe on temp. side. | flammatory reaction had sub- Not molested; by April 6, insided and eye was quiet; cataract; L. P. |
| 76 M. and S. | 4-18-23 (22,208) | Steel L. eye in 1897; not removed; R. eye now irritable. | F. b. 3x1 mm.; dense, well back in L. vitreous. | No vision L. eye, but irritable; enucleation advised to prevent sympathetic trouble on R. |
| 77 H. Y. | 5-11-23 (22,455) | Using hammer on metal, piece struck L. eye; deeply embedded. | F. b. localized in scleral wall nasal side L. eye. | Magnet extraction; 20/20 vision. |

TABULATION OF FOREIGN BODY LOCALIZATION IN THE EYE—Continued

| Ser. no. | Date and X-ray No. | History and Injury | Localization | Treatment and Result |
|---|---|---|---|---|
| 78 M. and S. | 5-28-23 (22,600) | Blasted; numerous f. bs. in corneae and about eyes. | No f. b. localized in either globe; many near by. | Many corneal bodies removed; some left in; L. eye still inflamed 7/24; vision on L. P. on left; on R. 15/15. |
| 79 M. and S. | 6-25-23 (22,837) | Chiseling; wound corneal margin L. eye; lens opaque. | 2 dense f. bs. lying close together in vitreous. | Extracted by magnet post. route; came out together; subsequent observation not recorded. |
| 80 M. and S. | 7-10-23 (22,896) | Drilling; L. eye injury; wound inf. portion cornea. | Dense f. b. 2x3 mm. in vit. above and to nasal side. | Scleral opening 6 mm. post. to limbus; magnet extraction; L. P. only account of cataract. |
| 81 M. and S. | 7-12-23 (22(922) | Blast in face; many corneal f. bs.; cataract each eye. | Many f. bs. about eyes; one in each globe. | Many bodies removed from each cornea; R. eye later enucleated; L. eye cataract removed; L. P. |
| 82 M. and S. | 7-13-23 (22,925) | Inj. 16 yrs. before; dyn. cap; R. eye lost; some vision in L. eye. | F. b. 1x2 mm.; not very dense, in L. vit. | Probably copper; not removed; shows tolerance of eye for copper. |
| 83 M. and S. | 8-1-23 (23,012) | Broke nose; claims eye injury; signs of old R. eye injury. | F. b. ½x½ mm. in region ciliary body R. eye. | Old eye injury with optic atrophy; no connection with present injury; eye blind. |
| 84 M. and S. | 9-5-23 (23,222) | 7-1-23 struck in R. eye; no x-ray; has scar in cornea and lens. | Small dense f. b. within lens, R. eye. | Removed giant magnet, ant. route; discission lens 10/116; has had left cataract removed |
| 85 M. and S. | 9-15-23 (23,292) | Dyn. cap; both eyes injured; R. eye worse; traumatic lens. | Small f. b. in each vitreous; some doubt in location. | R. eye totally blind; new pupil made in L. eye; see fingers at 1 foot. |
| 86 M. and S. | 10-1-23 (23,409) | Blast in face; iris and lens injury, each eye. | Many rocks about eyes; one in R. globe; L. eye (?). | R. eye total loss; operations on L. with L. P.; not certain about f. b. in left eye. |
| 87 M. and S. | 10-30-23 (23,690) | Hammering on pipe; hit L. eye; scleral wound on temp. side. | F. b. in sclera on temp. side of cornea; rock (?). | Was piece of steel; removed by magnet; very thin scale; error in interpreting density. |
| 88 M. and S. | 11-12-23 (23,810) | 9-6, tapping punch, hit R. eye; no visible scar on 11-12; no pain now. | Dense f. b. 1x2 mm. well back in vit. of R. eye. | Is not disturbing eye or vision at present; would not permit removal. |
| 89 M. and S. | 11-12-23 (23,811) | Blasted; many wounds about face and eyes. | Many f. bs. about eye; none inside globe. | Corneal scars; no intra-ocular injury; vision 20/20 each eye. |
| 90 M. and S. | 11-14-23 (23,818) | On 10-22 cut on cornea; no f. b. suspected; lens opaque. | Small dense f. b. in vitreous of L. eye. | Removed by magnet ant. route; May, 1924, cataract removed; vision 15/30 with correction. |
| 91 M. and S. | 11-21-23 (23,903) | Blasetd; f. bs. in R. eye (superficial); perforating wound. | Did not localize f. b. shadows in either eye; some near by. | Treated until Jan. 12, and discharged with good vision each eye. |
| 92 M. and S. | 11-26-23 (23,948) | Blasted; perforating wounds each globe; many corneal f. bs. | Numerous f. bs. and 1 in left eye; none located in R. globe. | R. eye destroyed; L. P. only in left; many rocks in each orbit and perhaps in each globe. |
| 93 M. and W. | 11-28-23 (23,958) | Blasted; many f. bs. about eyes and in cornea on each side. | At least 1 f. b. localized in each globe (rock). | L. P. in each eye; right may have to be enucleated; has rock in each globe. |

TABULATION OF FOREIGN BODY LOCALIZATION IN THE EYE—Continued

| Ser. No. | Date and X-ray No. | History and Injury | Localization | Treatment and Result |
|---|---|---|---|---|
| 94 M. and S. | 12-14-23 (24,129) | Blasted 11-27; severe injury to each eye, but worse on R. | No f. b. shown inside globes; many just against them. | R. eye destroyed; corneal f. bs. removed from left; few small ones left; vision 15/20. |
| 95 D. F. H. | 1-1-24 (24,289) | Dyn. cap explosion; many f. bs. about both eyes. | Many f. bs. about eyes; one in L. vit.; none in R. globe. | Magnet tried; no result. Eye said to have been removed by another doctor. |
| 96 M. and S. | 1-30-24 (24,616) | Working cement floor; 2 mm. linear wound at L. nasal limbus. | F. b. 1x½ mm. in vit. of L. eye, far back. | Magnet applied; relocalization showed f. b. in ciliary region; removed ant. route; lens opacity. |
| 97 J. J. M. | 2-1-24 (24,643) | Hammering on steel; f. b. struck L. eye. | Small dense f. b. in nerve head of L. eye. | Small magnet unsuccessful; giant magnet removal; iridocyclitis; enucleation. |
| 98 M. and S. | 2-21-24 (24,866) | Injury to R. eye; all intra-ocular structures normal. | F. b. just outside of globe, nasal side. | F. b. removed; no damage to intra-ocular structures or vision. |
| 99 M. and S. | 3-4-24 (25,000) | Flying steel L. eye; corneal wound 3 mm. from inf. nasal limbus. | Dense f. b. 1x2 mm. on floor of vit. L. eye. | Drawn out by magnet through wound of entrance; cataract removed; eye O. K. June 2. |
| 100 D. F. H. | 4-28-24 (25,603) | Flying steel in L. eye; no notes on appearance. | 1x2 mm. f. b. in post. scleral wall. | Not extracted; on June 11 eye was quiet and vision 15/40. |
| 101 M. and S. | 4-28-24 (25,615) | Blasted; both eyes injured; corneal wound on R. | F. b. in vit. on R.; one against cornea on left. | R. eye enucleated in June; rock in vitreous; left eye quiet with some lens opacity. |
| 102 M. and S. | 6-13-24 ((26,111) | Explosion; many f. b. wounds of aech eye. | Many f. b. shadows about eyes; not def. ocalized. | R. eye enucleated on account trauma; vision left 10/200. |
| 103 M. and S. | 6-28-24 (26,240) | Chipping on brass; perforating wound of sclera, nasal side. | Very large f. b. in vit. of R. eye, 9x4x2 mm. | Piece of brass removed by forceps through scleral opening. Sept. 9, eye quiet; some vision. |
| 104 M. and S. | 7-29-24 (26,455) | Rock (?) in R. eye; small linear scar in cornea; lens cloudy. | Small fleck ½ mm. diam. in lens. | Removed by magnet ant. route. Sept. 10, vision 15/40 with small corneal opacity; lens clear. |
| 105 M. and S. | 8-27-24 (26,637) | Flying metal R. eye; corneal wound, nasal side. | Large dense f. b. in upper part of orbit, outside eye. | Evidently wounded cornea in passing; not removed; some corneal scar left. |
| 106 M. and S. | 9-8-24 (26,709) | R. eye struck while watching; 4 mm. wound of cornea, nasal side. | Shadow external to globe; not metal. | Eye cleared with slight cloudiness of lens; no f. b. though intra-ocular changes. |
| 107 M. and S. | 10-4-24 (26,997) | Chiseling; L. eye inf.; linear wound, cornea; lens cloudy. | Dense f. b., 1x2 mm. in vitreous, L. eye. | Removed by giant magnet; traumatic cataract removed 10/26, but no vision. |
| 108 M. and S. | 10-27-24 (27,261) | Breaking rock; L. eye inj.; wound of cornea; iris prolapsed. | No. f. b. shadow found in globe; one near by. | Iris amputated; recovery of eye and vision (15/15); R. eye blind, previous injury. |
| 109 M. and S. | 10-31-24 (27,324) | Rock (?) struck L. eye; no visible wound of globe. | Dense f. b. 2x1½ mm. in ciliary region L. eye. | Magnet extraction ant. route; 2-10-25, vision 15/50. |
| 110 M. and S. | 11-21-24 (27,592) | Both eyes injured some weeks before. | Many f. bs. near eyes; one against R. sclera. | R. eye enucleated account infection; corneal opacity on left; vision, fingers one foot. |

TABULATION OF FOREIGN BODY LOCALIZATION IN THE EYE—Continued

| Ser. No. | Date and X-ray No. | History and Injury | Localization | NINETEEN |
|---|---|---|---|---|
| 111 M. and S. | 11-26-24 (27,655) | Cap explosion; R. eye wound at nasal limbus. | Did not show f. b. localizing in eye. | Blood clot in vit. Eye was later enucleated; no record as to whether f. b. was found. |
| 112 M. and S. | 12-4-24 (27,736) | Blasetd 10-12; several corneal scars. | F. bs. near but not within globe. | Vision somewhat interfered with by corneal scars. |
| 113 M. and S. | 12-6-24 (27,771) | Blast; wound of cornea and lens on left. | Small f. b. rock (?) in vitreous. | Infection and enucleation: rock found in vitreous. |
| 114 M. and S. | 12-24-24 (27,961) | Cap explosion; both eyes injured. | Small f. b. in L. behind lens; no f. b. located in R. | F. b. seen by scope in R. lens; L. lens opaque; neither eye molested; copper f. b. in each. |
| 115 M. and S. | 12-27-24 (27,993) | Exploded percussion cap; no corneal wound; intra-ocular damage. | Dense f. b. below and to nasal side of R. eye. | F. b. not molested, as probably globe was not penetrated. |
| 116 F. L. R. | 1-29-25 (28,433) | Auto mechanic; chipping; f. b. in R. eye. | Against sclera above hor. plane. | Magnet; three subsequent localizations showed no change in position; embedded or non-magnetic. |
| 117 M. and R. | 2-13-25 (28,607) | Blasted 12-13-24; many f. b. injuries to each cornea. | Many f. bs. near each eye, but not within. | Superficial corneal bodies removed; deep ones left. Vision L. 15/50 and R. 15/30. |
| 118 P. and G. | 2-17-25 (28,811) | Explosion. | Several f. bs.; one against ext. scleral wall R. eye. | Record of treatment and result not available. |
| 119 M. and S. | 3-5-25 (28,908) | 10 yrs. before, f. b. in L. eye; vision failing; lens opaque. | Thin f. b. 2½x1 mm. in vitreous of R. eye. metal. | No vision; irritable; enucleated and f. b. found. |
| 120 M. and S. | 3-19-25 (29,122) | Explosion; many f. bs. in each cornea. | Many f. bs. near globe, but none within either. | Superficial bodies removed; deep ones left; vision 15/40 each side, with correction. |
| 121 M. and S. | 3-20-25 (29,154) | R. eye injury; two recent corneal scars. | F. bs. about each eye; one in R. post chbr | F. b. changes position; localized in post. chamber later in ant. chamber on opp. side of pupil. |
| 122 M. and S. | 4-3-25 (29,343) | Blasted; many corneal injuries of each eye. | F. b. not definitely localized in either globe. | L. eye enucleated; copper f. b. in vitreous. Lens extracted on rt.; may have f. b. in vit. |
| 123 M. and S. | 4-15-25 (29,565) | Blasted; numerous f. b. injuries each eye. | Many faint f. b. shadows; none def. within globe. | Both eyes destroyed; bodies in each globe; too small and faint to show by x-ray. |
| 124 M. and S. | 4-15-25 (29,566) | Cap explosion; wound through center of cornea. | Rock (?) 1 mm. diam. in vitreous in R. eye. | Eye enucleated and f. b. found in position shown; does not state whether copper or rock. |
| 125 M. and S. | 5-8-25 (29,994) | Explosion; R. corneal scar; no intra-ocular changes. | Very smal particles adjacent to globe; none in. | Eye quiet on May 14; vision not disturbed in either eye. |
| 126 M. and S. | 5-18-25 (30,181) | 7 mos. before struck in eye when picking; bda. drop of oil fell in eye. | Small dense f. b. 1x½ mm. in vitreous L. eye. | No recent injury; L. P. only in eye; f. b. removed by magnet; suppurated; enucleation advised. |
| 127 M. and S. | 6-12-25 (30,514) | Blasted; many f. bs. on cornea each side. | Small f. b. in L. globe: none found in R. | Both eyes irritable; cataract removed from L. eye (V. 15.40); believe fine f. b. in R. eye. |

TABULATION OF FOREIGN BODY LOCALIZATION IN THE EYE—Continued

| Ser No. | Date and X-ray No. | History and Injury | Localization | Treatment and Result |
|---|---|---|---|---|
| 128 M. and S. | 6-27-25 (30,732) | Age 12; hammering; R. eye perforating wound of cornea nasal side. | 2½x1 mm. f. b. in lower ciliary area R. eye. | Magnet extraction ant. route: tension minus; prognosis not good. |
| 129 M. and S. | 7-4-25 (30,795) | L. eye inj. in 1914; no vision; R. eye now irritable. | 2x1 mm. f. b. in L. vit. against scleral wall. | No treatment at present; glasses. |
| 130 M. and S. | 8-8-25 (31,124) | Age 12; dyn. cap exp.; wound lower limbus; lens opaque. | 1x1 mm. f. b. in vit. R. eye; dense like metal. | No. magnet response; advised enucleation as no vision and may become irritable. |
| 131 M. and S. | 8-15-25 (31,196) | Blasted; many f. bs. in each cornea. | Many f. b. shadows near globe; none inside. | Corneal f. bs. removed; intraocular injury to left eye; cataract; eye quiet Nov. 30. |
| 132 M. and S. | 10-23-25 (32,044) | Struck steel 9-27; removed; not certain that all removed. | Very small f. b. in lens area. | Removed by gianat magnet; vision 20/20. |
| 133 M. and S. | 11-19-25 (32,489) | Injured 11-15; blast in face; both eyes; many f. bs. | Did not localize f. b. in either globe. | L. eye enucleated; R. eye saved with 15/20 vision after correction. |
| 134 M. and S. | 12-18-25 (35,951) | Picking rock; R. eye corneal wound; lens opaque. | 2x3 mm. f. b. in R. vitreous; density of metal. | Magnet extraction through wound of entrance; infection; enucleation. |
| 135 M. and S. | 12-28-25 (33,072) | Blasting cap; wound center of cornea. | Small f. b. in vit. L. eye, of metal density. | Eye continued inflamed and was enucleated Jan. 26; copper f. b. found as located. |
| 136 M. and S. | 2-5-26 (33,700) | Powder explosion; many f. bs. each cornea, 175 in R. and 375 in L. | All visible f. bs. external to the globes. | Eyes quiet on May 10; fair vision each eye; slight opacity left lens. |
| 137 S. S. | 2-5-26 (33,715) | Does not know how injury was sustained; poor vision. | 1x½x½ mm. f. b. in ant. chamber R. eye. | Patient did not return for treatment. |
| 138 M. and S. | 2-10-26 (33,779) | R. eye injury; perforating corneal wound. | Dense f. b. in post. scleral wall. | Infection; enucleation; f. b. found as located. |
| 139 M. and S. | 2-10-26 (33,783) | Explosion; corneal injuries each eye. | F. bs. all outside of globe, near by. | Not molested; eyes recovered, with normal vision. |
| 140 M. and S. | 3-10-26 (34,192) | Blast in face; many f. b. injuries each eye. | F. b. in L. globe; very faint shadows. | Both eyes destroyed by force of blast and corneal f. bs. |
| 141 D. F. H. | 3-8-26 (34,209) | Dyn. cap explosion; many f. bs. about eyes. | Not def. localized in eye. | Eye later removed on account of panophthalmia; no f. b. found in globe. |
| 142 M. and S. | 4-8-26 (34,731) | Percussion cap; copper particles about L. eye. | Pinpoint densities over globe area. | Very small f. b. seen in lens. Proved to be magnetic and was removed with magnet; some lens opacity. Older injury? |
| 143 M. and S. | 5-26-26 (35,644) | Wound through upper lid; no intra-ocular signs; no vision or L. P. | Large f. b. post. to globe in nerve area. | Swelling and edema subsided; f. b. not removed; probably injured nerve. |
| 144 M. and S. | 6-2-26 (36,233) | Cleaning pipe 6 wks. before; struck in R. eye; corneal scar. | Small dense f. b. far back in vitreous of R. eye. | Could see a pinpoint size f. b. in lens also, not shown by x-ray; both f. bs. removed by magnet; prognosis good. |
| 145 M. and S. | 6-16-21 (17,012) | Blasted; many f. bs. in conj. and cornea. | No f. bs. localize within the globe on either side. | Corneal f. bs. removed; lens opacity on L., vision 2/200; lens clear on R., vision 15/15. |
| 146 M. and S. | 6-16-21 (17,015) | Blasted, with many corneal f. bs. on each side. | On R. one f. b. on sclera, temp. side; none in L. globe. | Corneal particles removed. R. vision, hand movements, L. 15/100. Corneal opacities. |

# COPPER FOREIGN BODIES IN THE EYE WITH REPORT OF THIRTY-SEVEN CASES

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Copper was the first metal mastered by man and, next to iron, is still the world's most important metal. It is found in nature as cuprous sulphide, the double sulphide of copper and iron, cupric oxide, cupric carbonate and, rarely, uncombined in crystallized isometric form or masses. The metal has a characteristic red color and is very malleable, ductile and tenacious. In the presence of moisture it is readily oxidzied and absorbs carbonic acid gas. It is extensively used as metallic copper and the alloys of copper, such as brass and bronze.

When copper ore enters the eye, the amount of copper contained is so small that the foreign body does not have the usual characteristics of copper but more those of rock. The usual type of copper foreign body met with, is copper in the pure state.

In the records of the late Dr. Martin and myself, there are 291 of intra-ocular foreign bodies. Of these, thirty-seven are copper.

Most of the copper eye injuries occurred in the mining industry where large quantities of dynamite and copper percussion caps are used. In other trades and industries this type of injury is rare. The explosion of percussion caps was found to be by far the most common cause of injury. The caps are constructed entirely of copper. They are 8 mm. in diameter, 30 mm. long, open at one end and contain a charge of fulminate of mercury at the bottom. When the explosion occurs, the thin copper sheet, of which the caps are made, is torn and rolled into scroll-like fragments which may penetrate the eye. Frequently these accidents occur outside of the mines. Eight of our cases were in children under fourteen years of age. They found the caps and exploded them while at play.

The cause of injury by copper, in our series of cases, was as follows:

1. Percussion cap explosions—28
2. Percussion cap plus dynamite explosions—6
3. Cutting copper rivet—1
4. Chipping brass plug—1

According to Herschberg, the causes of injury to the eye by copper are:

1. Discharge of poorly constructed guns
2. Accidental explosion of percussion caps
3. Industrial work

The determination of the presence of copper in the eye is dependent upon three factors: the history of the case; the clinical examination; the x-ray.

The patient usually gives a history of having been in an explosion where a percussion cap was used, or was working with copper at the time of the injury.

The clinical examination may reveal particles of copper imbedded in the skin about the eye on the conjunctiva and cornea. A careful search is necessary to determine if the foreign body has entered the globe. If it passes through the cornea we can see the wound or scar and, just after the injury, signs of a perforation: namely, the loss of anterior chamber and reduction of tension. We try to follow the course of the foreign body. There may be a perforating wound of the iris and the lens may show an opacity. If it enters the eye through the sclera we often find a hemorrhage in the vicinity of the wound, or a portion of vitreous or uvea may be present. Usually copper is readily detected in the anterior chamber, but the angle of the chamber may form a hiding place, or it may be obscured by a hemorrhage. When copper is buried in the lens, it can nearly always be seen; if in the vitreous and the media is clear, it can sometimes be detected by the yellowish red reflex seen by focal illumination, the ophthalmoscope and slit lamp. If it has been present in the eye for a long time, the various structures gradually assume a greenish color which is known as chalcosis. This is in distinct contrast to the brownish color of the tissues designated as siderosis, when the foreign body is of steel. Chalcosis occurs much more slowly than siderosis.

In all eye injuries in which there is the slightest possibility of an intra-ocular foreign body, an x-ray examination is imperative. This will reveal the presence of a foreign substance, if it is of sufficient density to cast a shadow. When the presence of a foreign body has been established, the x-ray is used to determine its exact location with respect to the globe.

The opacity or density of various substances to the x-ray is in direct ratio to their specific gravity, as is shown in the following table:

| | | | |
|---|---|---|---|
| 1. Water | - 1 | 6. Glass | - 3 |
| 2. Pine wood | - .5 | 7. Iron | - 9.1 |
| 3. Bone | - 1.8 | 8. Copper | -12.5 |
| 4. Rock | - 2.5 | 9. Lead | 18. |
| 5. Aluminum | - 2.6 | | |

In this locality the most common foreign bodies from which copper has to be differentiated are rock and steel. The x-ray is a big factor in this. It is possible to distinguish between the shadow cast by copper and that of rock, copper casting a much denser shadow. The history also helps us

here for, in dynamite explosions the foreign body is usually rock, and in percussion cap explosions it is most commonly copper. The difference in the density of copper and steel is small, and it is often impossible to distinguish between them. This handicap may be overcome by the use of the magnet. Steel, being magnetizable, can usually be extracted while copper, which is non-magnetic, cannot.

When the foreign body is not visible we cannot be sure that it is copper—but the supposition that such is the case is dependent upon the following factors:

1. The history of the case
2. The development of chalcosis
3. The fact that it is non-magnetic
4. The x-ray

Copper undergoes chemical changes in the fluids of the eye and the salts of copper —particularly the carbonate of copper—can usually be extracted from the tissues. From observations up to the present time, it has been found that no organic compounds of copper carbonate develop with the albumin of the cells. Slow "coppering" may take place in all the tissues of the eye. There is a typical greenish sunflower clouding with its characteristic border rays. The lens shows a diffuse greenish gray color as well as a distinct iridescence.

Copper, as we know, is the most dangerous of all intra-ocular foreign bodies. The tolerance of the various structures of the eye to it varies greatly. If in the cornea and sclera, it may be borne indefinitely, but it usually has a tendency to slough out. When in the anterior chamber, it is probably more of an irritant than other foreign substances, but is often quietly carried in this location for years.

The lens tolerates copper better than any other structure of the eye. Copper in the vitreous is a very serious condition. It has a marked corrosive effect which is very destructive. A pus focus often forms around it. This has many times been demonstrated to be sterile, according to Leber's experiments and studies made by Weeks.

Copper, like other foreign bodies, may carry organisms into the eye. The infection plus the irritating effect of copper usually causes a vitreous abscess and the loss of the eye.

There is a marked difference in the resistance of eyes toward copper. It has an immediate action and a late action. The immediate action is due to corrosion alone or corrosion plus infection. There is often a marked reaction producing pus or an exudate in vitreous; retinal detachment with loss of light perception, and it is necessary to enucleate the eye. These symptoms commonly occur within the first three weeks. If there is little or no reaction from the copper during this time, then it is borne nearly as well as other metallic foreign bodies. Of course, at any subsequent time the eye may be lost by a slowly progressing iridocyclitis. And it is quite common to have glaucoma develop. There is also the big danger of sympathetic ophthalmia occurring, and the eye has to be kept under constant observation.

There are many cases on record to show that copper is sometimes well tolerated. Melville Black observed a particle of copper in the center of the vitreous for fifteen years. Decker reports a small splinter of copper in the vitreous for six years, causing no irritation. Ruhberg cites a case observed for twenty years with copper in the vitreous. Raulin reports a piece of copper in the vitreous for twenty years.

Franklin and Cordes placed on record a case of copper in the vitreous for forty years, when it became necessary to enucleate. A bony cup filled the vitreous chamber, surrounding the copper.

Hertels states that, during the late war, fifty per cent of the eyes containing copper foreign bodies were lost.

Oloff observed a piece of copper in the lens for seven years. Vision remained 6/8.

Since copper is a non-magnetic foreign body, its extraction from the eye is a difficult problem. Of course, particles on the conjunctiva and those superficially imbedded in the cornea and sclera can be easily removed. When deep in the cornea, where their extraction might cause perforation or marked scar formation, it is best to leave them alone. If in the anterior chamber, it is possible, after making a corneal section, to grasp the copper with forceps and remove it. Should the foreign body be imbedded in the iris, one can extract it by doing an iridectomy.

Copper in the lens is usually left alone but if the lens is cataractous it can be gotten rid of by extracting the cataract. It is usually impossible to remove copper from the vitreous. In fact the difficulties are so great that it is rarely attempted, but, if the foreign body is large and visible, I feel that one should try to remove it, because the eye is usually lost if it is allowed to remain. In the case W. J. M. of our series, a large piece of brass lying in the vitreous could be seen with the slit lamp and ophthalmoscope. Posterior section of the sclera was made and forceps introduced into vitreous. Through the pupil we could see the foreign body and the forceps and were able to grasp

and extract the piece of brass. Recovery was uneventful. Four months later the eye was entirely quiet. (See illustration for localization by x-ray and size of foreign body.)

A recent case of Shahan suggests the possibility that in those cases where the vitreous liquifies, an incision can be made large enough to let the fluid out without damaging the base. The fluid mass containing copper or copper solution is allowed to run out and the eye may be saved.

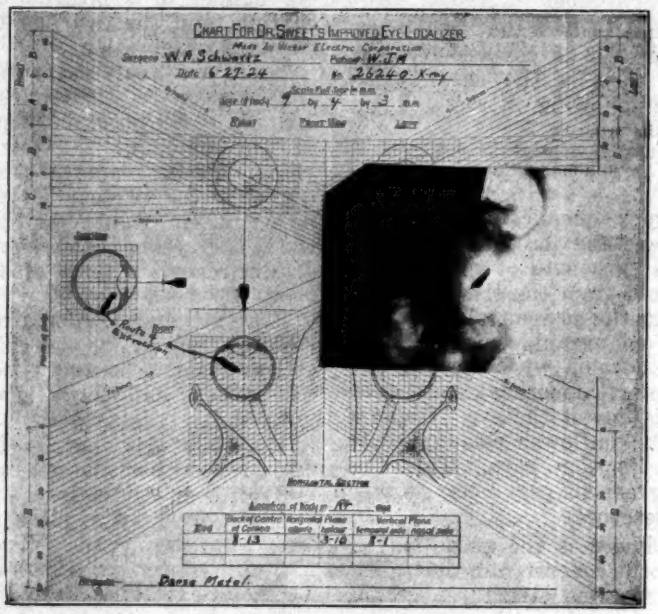


Fig. 1. W. J. M., injured June 22, 1924. Examinatoin of right eye on June 26 showed perforating wound of sclera on nasal side about 1½ mm. from limbus. Anterior chamber normal; lens slightly cloudy; hemorrhage into vitreous; fundus not visible; vision—fingers at 4 feet. X-ray showed large foreign body, measuring 9x2x4 mm., in vitreous chamber, one extremity close to sclera of temporal side. On June 26 incision was made through sclera, over end of foreign body; it was fiund to be non-magnetic and was removed with forceps, proving to be a particle of brass. On August 14 patient was discharged; eye was quiet; no changes in cornea or lens; massive opacities in vitreous; upper part of fundus could be indistinctly seen; vision—hand movements at one foot. Comment.—Localization of this fragment, so that scleral incision could be made over one end of it, made possible its removal without further trauma. It is very unusual to remove so large a non-magnetic foreign body from the globe and still preserve any vision, or even to preserve the eye for cosmetic value.

The case was that of a patient aged fifty-one, who had only one eye and in the vitreous was a piece of copper. An incision was made in the cornea as usual, but before that was completed the vitreous began to flow out. The incision was completed and the globe caved in. The lens nucleus was removed with a loop. The wound gaped. He filled the anterior chamber with normal saline solution, thinking the eye was lost. When the bandage was removed four days later the globe had rounded out. Three or four weeks later the coretx filled the anterior chamber to a point where a secondary glaucoma developed. It was necessary again to open the eye, and again it caved in and the globe collapsed. The mass of cortex was worked out and the eye again filled with normal saline. Final vision was 20/15. It is still a good eye after one year.

The copper may be absorbed, as in Green's case, where the copper could be seen in the vitreous by the ophthalmoscope and in eighteen months had entirely disappeared.

Occasionally copper is spontaneously extruded from the vitreous.

Jacquean reports a case of copper wire one centimeter long in the vitreous. An attempt at extracting was unsuccessful. Ten months later, when the eye was entirely calm, the wire pierced the end of the old incision and was easily removed.

Mock saw a piece of copper wire which

followed periods of slight irritation, escaped through the sclera and was found lying under the conjunctiva eight months later.

Halvez cites two cases of spontaneous escape of copper particles from the vitreous.

Proun observed a case where a piece of copper in the vitreous, nine months later was protruded through the sclera.

The results in our series of thirty-seven cases are as follows:

Nineteen eyes, or fifty-one per cent, were enucleated. Of these, sixteen were removed during the first month and three at later dates. In one case, sympathetic ophthalmia developed and the eye had to be enucleated.

Eighteen eyes were saved. Copper was removed from four of these:

a. One from anterior chamber
b. One from the lens
c. One from the ciliary body
d. One from the vitreous

Copper was retained in fourteen cases:

a. In anterior chamber—3
b. In lens —2
c. In vitreous —9

The vision was:

1 case with 20/20
3 cases with 15/20
3 cases with 15/30
1 case with 15/70
2 cases with 15/100

In four cases there was no record of vision.

So we see that over fifty per cent of eyes injured by copper are lost. Now what can be done to prevent this great loss of eyes?

First, we must prevent such accidents. Most of them are due to the explosion of percussion caps. Persons using them must be instructed as to their danger and warned not to leave them around indiscriminately where children can find them.

Second, there is great need for further research as to the chemical action of copper on the eye. Who knows but in the near future we may be able to neutralize the corrosive action of copper by the injection of certain chemicals into the eye, and thus save many eyes which now are lost.

BRIEF OF CASES

I. W. V., age 8. Injured Oct. 15, 1903, by the explosion of a percussion cap.

O. S. was so badly damaged that immediate enucleation became necessary. The vitreous contained a piece of copper 3 by 2 mm., surrounded by a pus focus.

....O. D. In the cornea were imbedded two particles of copper which were removed. There was a penetrating wound at the temporal sclero-corneal margin, with a coloboma of the underlying iris. There was also a penetrating corneal wound to the nasal side, with a corresponding coloboma of the iris. Traumatic cataract. Cataract was removed. With a plus 12, vision was 20/30.

May 12, 1918, states the eye has caused him no trouble. The x-ray shows a foreign body in the vitreous. Vision with correction was 20/20.

II. 27-5496. F. M. Age 12. Seen July 28, 1910. Six weeks before, received an injury to the left eye by explosion of percussion cap. At corneo-scleral margin, on nasal side, is showing a perforating wound 3 mm. in length. Pupil occluded. Iris drawn tightly to area of wound. Due to tension on the iris it has become veil-like in appearance and, in places, separation of the iris is found. Lens and intra-ocular structures cannot be seen. Piece of copper 3 by 6 mm. imbedded in ciliary body, was removed on July 29, 1910. Enucleation advised should the eye become irritable.

III. 28-5518. M. M. Seen August 4, 1910. Struck in left eye by a piece of copper rivet, cutting lower lid and penetrating cornea on nasal side. Wound 4 by 5 mm. Iris prolapsed. Anterior chamber filled with blood clot and pus. Marked edema of conjunctiva. No light perception. On August 11th, eye enucleated. Foreign body surrounded by pus in vitreous.

IV. 33-6697. M. A. Age 13. On December 8, 1911, while playing with percussion cap, exploded same with lighted candle. The left eye shows a perforating wound of the lower lid and a perforating wound of the sclera 8 mm. below corneo-scleral margin. Globes lightly flattened at point of injury. Pupillary area clear, oval in shape; no vision. Eye remained quiet. Copper probably retained in vitreous.

V. 33-6698. R. A. Age 13. On Dec. 8, 1911, exploded a percussion cap by a lighted candle. The right eye shows at the corneo-scleral margin on nasal side, marked ciliary injection. Occluded pupil on nasal side. Enucleated.

The left eye shows a piece of copper imbedded deep in corner in lower outer quadrant. Piece of copper lodged in lens, which is opaque. Lens matter and copper extracted. Vision, with plus 13, is 15/20.

VI. 35-7100. P. G. Seen on July 12, 1912. Placed a brass rifle shell on muzzle of a rifle and fired. Examination showed wound of the cornea extending from the center of the pupil to sclero-corneal margin and dividing iris and injuring lens. Lens opaque. Vision, light perception. Magnet applied with no results. X-ray shows foregin body located in vitreous.

Right eye normal. Vision 20/20.

VII. 33-6691. M. M. Seen on December 31, 1912. On Dec. 8th placed candle on post on which was a percussion cap. Explosion followed. Pieces of copper found on various parts of body.

Examination of left eye shows a superficial wound of the cornea on the temporal side. No evidence of injury to the iris or lens. The vitreous chamber shows a large floating mass of a greenish tint. No fundus reflex. No vision. Eye quiet. Enucleation advised should irritation set in.

VIII. 40-8230. S. W. Age 8. Seen on Oct. 7, 1913, while at play, exploded percussion cap.

Examination of the right eye shows perpendicular division of the cornea extending into the sclera above and below. Anterior chamber filled with blood clot. X-ray shows foreign body in vitreous. On Oct. 9th pus appeared in the wound. Eye enucleated. Two pieces of copper found in vitreous. Vitreous disorganized and filled with blood clot. The crystalline lens was absent.

IX. 42-8559. F. J. Seen on Jan. 19, 1913. Springing hole in mine struck in right eye by foreign body. No pain. On second day noticed irritation and secreting. On evening of second day first noticed decided disturbance of vision. Conjunctival and ciliary injection. Cornea clear. Iris dark. Left iris gray. State formerly both eyes were gray. Pupil irregular. Posterior synechiae. Lens clear. Red reflex in vitreous. Probably hemorrhage. Tension minus. Vision, counts fingers at eight inches. X-ray shows foreign body in vitreous. Foreign body changes position on movement of eye. Magnet ap-

plied giving negative results. Eye enucleated Jan. 23. Examination revealed piece of copper 6 by 4 mm. in vitreous, focus of pus, large blood clot and detached retina above.

X. 44-8876. R. S. Age 10. Seen April 7, 1914. On Feb. 24 injured right eye by explosion of a percussion cap. Vision remained good for eighteen days after injury. Externally eye showed no inflammation. No pain. No photophobia or lachrymation.

Examination of right eye has appearance of being slightly smaller than left. Pupil reacts normally to light and accommodation. Tension minus. Opacity cornea below pupil. Scar of sclera 10 mm. below corneo-scleral margin. Anterior chamber normal. Lens clear. No vitreous opacities. The entire fundus has a changeable appearance. The disc is slightly swollen and margin blurred, the region of the muscle appears pale wtih deep pigmentation on temporal side. Foreign body passed through globe and lodged in the soft tissue of the orbit. Foreign body not removed.

Left eye normal.

XI. 44-8896. A. L. Age 25. Seen April 22, 1914. Eight days ago on way to motion picture show wind blew a foreign body into left eye. Rubbed eye and it became inflamed at once. On May 5, 1913, was in mine explosion and received injury to right eye and slight injury to left eye.

Examination of left eye shows congestion, lachrymation and photophobia, small piece of copper imbedded in cornea near lower scleral margin. Large piece of copper 10 by 4 mm. floating in lower anterior chamber. Lower half of cornea cloudy. Pupil 6 mm. Responds normally to light. Lens opacities. Though a keratome incision the foreign body was removed from anterior chamber. Eye remained quiet. Lens not extracted.

Right eye shows a foreign body deep in cornea just above center. Many opacities of the cornea. Traumatic iridectomy in lower nasal quadrant. Lens opaque and partially absorbed. Sept. 6, 1916, lens capsule incised. Vision, with plus 9, is 5/10.

XII. 44-9094. J. B. Age 53. Seen Dec. 10, 1916. One month ago building camp fire, a percussion cap exploded on ground, foreign body striking left eye. Vision lost immedaitely. Marked ocular, supraorbital and occipital pain. Left eye shows congestion; perforation in lower half of cornea, at which point is located an ulcer. Entire cornea hazy. Discolored iris. Two small pieces of copper on iris surface. X-ray shows foreign body in posterior part of vitreous chamber.

Right eye shows no evidence of injury.

Dec. 13, 1914, left eye was enucleated. Pus and piece of copper found in vitreous.

XIII. 51-9879. F. B. Age 46. Seen on March 25, 1916. While shoveling coal into a furnace, there was an explosion, presumably a percussion cap.

Examination of the left eye shows the conjunctival and ciliary vessels full. Perforating wound of the cornea in lower segment, about 2 mm. long. Wound of iris margin below corneal wound. Blood clot in anterior chamber. Lens opaque. X-ray reveals foreign body on floor of vitreous chamber. April, 1916, left eye enucleated. Piece of copper 2½ by 2½ mm. found in vitreous chamber.

Right eye normal.

XIV. 52-10785. M. O. Seen Oct. 3. 1916. Was working in a mine at 3 p. m. Went to the surface where he had a fire, upon wh'ch he placed a small piece of wood and about five minutes later an explosion occurred. Immediate loss of vision of left eye.

The left eye shows ciliary and conjunctival vessels full. Several corneal scars. Three small particles of copper on cornea. Lens hazy, through which red reflex is seen and through which foreign body probably passed. Coloboma of iris. Anterior chamber normal. Color of iris equal in both eyes. Pupil irregular. Two posterior synechiae, uveal pigment deposits on anterior capsules of lens. Large white exudate area over mascula is a round coloboma of the choroid with margins sharp and surrounded by dark ring. About 2 mm. anterior to colobtoma is a light pink colored body of dumbbell shape, which may be shreds of tissue. Vision 15/30. Right eye normal.

XV. 56-11447. T. M. Age 21. Seen on Dec. 21, 1916. Both eyes injured as a result of a percussion cap explosion.

O. D. shows a small pterygium extending 1 mm. into the corneal surface. Moderate conjunctival and pericorneal injection. Cornea studded with a number of scars, pin-head and pin-point in size. There are also large numbers of minute, deeply buried. foreign bodies in corneal structures. Several foreign bodies of copper lying in anterior chamber. O. D. vision, 15/30.

O. S. condition in all particulars similar to O. D. Foreign bodies deeply buried in cornea. Pterygium smaller than in O. D. All intra-ocular structures normal. Lens clear. Vision, O. S., 15/20. Patient returned home.

XVI. 53-11002. S. J. M. Age 32. Seen Feb. 9, 1917. On Dec. 12, 1916, explosion of percussion cap injured both eyes.

O. D. enucleated by Dr. Wales.

Patient's O. S. was not injured at time of accident. No history of previous injury. Vision has always been good. Examination shows lids normal. Pupil reacts to light and accommodation. No fullness of bulbar vessels. Cornea shows an opacity just over temporal pupillary margin. Two small pieces of copper imbedded deep in cornea. The lens show a small opacity on temporal side. The lens opacity has several ray-like striations. In the lens opacity can be seen imbedded a piece of copper. Patient told to return home until such time as cataract is operable. Vision, 15/70.

XVII. 55-11340. F. L. Age 43. Seen April 25, 1917. Six months previous while holding percussion cap in hand, fell, exploding the cap, injuring both eyes.

O. D. enucleated.

O. S., light perception only. Has corneal wound at nasal margin. Pupil oval and displaced to nasal s'de. Active to light above only. Posterior synechia on temporal side and below. Lens opaque. April 28th, iridectomy and, on June 19, lens extracted. July 13, discission papillary membrane. April 5, 1919, vision 9/200, with correct'on. Still carries piece of copper in globe.

XVIII. 57-11662. W. L. Age 33. Seen July 24, 1917. Two days before, percussion cap exploded, filling left forearm, face and left eye with rock and pieces of copper. Vision immediately lost. Pain not severe since injury.

O. S. vision normal. Marked conjunctival and ciliary injection. Punctured wound at sclero-corneal margin on nasal side just above horizontal meridian in which is presenting iris or uvea. Cornea clear except wound in inferior nasal quadrant. Hemorrhage in anterior chamber. Ir's darker than fellow eye. Pupil dilated, and pear-shaped. Lens opaque. Fundus not visible. Vision, light perception only. Tension minus. July 25, 1917, O. S. enucleated. Pieces of copper removed from fundus at optic nerve.

O. D., normal appearance. Vision 20/20.

XIX. 61-12446. F. S. Age 48. Seen March 29, 1918. Blasted in August, 1917. Large number of foreign bodies deeply buried in cornea of both eyes. O. D. One copper foreign body in lower angle of anterior chamber. Lens opacities. Pterygium on nasal side 4 mm. on thecornea. Vision 15/200 lower field only.

O. S. Corneal opacities and foreign bodies. For-

eign body deep in anterior chamber. Pupil occluded and iris bombé. Light perception only. Eye very painful and marked irritability. April 5, 1918, O. S. enucleated.

XX. V. A. Injured Nov. 18, 1918, by blasting cap. Left eye destroyed and right eye has developed cataract. Seen Feb. 25, 1919.

O. S. Globe destroyed and atrophic.

O. D. Periphery of cornea hazy, and to temporal side of pupillary area small particle of copper. Lens clear and no evidence of cataract. Vitreous filled with dense opacities, fundus details not visible. Superior nasal quadrant dark mass, blood clot or detached retina. Has tubular vision only, with vision for distance equal to 15/20. Foreign body localized in globe; not magnetic and probably copper.

Left eye enucleated to protect right from sympathetic irritation. Prognosis guarded as to continued integrity of right eye.

XXI. 64-12124. O. B. B. Age 10. Seen Nov. 19, 1918. Twenty-four hours before, a dynamite cap exploded in the hands of a companion. Filled right side of face with copper particles.

O. D. conjunctival and ciliary injection. Anterior chamber filled with a blood clot. Traumatic iridectomy. Nov. 21, O. D. enucleated. Two pieces of copper found in vitreous, surrounded by a pus focus.

XXII. 64-12210. E. E. Age 7. Injured Jan. 17, 1919, by the explosion of a percussion cap.

O. D. Perforating wound of cornea; small particles of copper in the wound. Blood clot in anterior chamber.

Traumatic iridectomy underlying corneal wound. Slight photophobia. Globe soft. Eye enucleated four days after injury. Small piece of copper in vitreous, surrounded by a pus focus.

XXIII. 65-13358. V. A. Age 46. Seen Feb. 26, 1919. Injured by blasting cap.

O. S. Penetrating wound of cornea. Hemorrhage in anterior chamber. X-ray shows two foreign bodies in vitreous. No light perception. O. S. was later enucleated.

O. D. Small piece of copper in conjunctiva and cornea. Upper half of fundus not visible. Vitreous filled with dense opacities. Red reflex visible on temporal side. Two-thirds superior nasal quadrant is dark. Possible retinal detachment. Corneal periphery hazy. Vision 15/20. Field contracted (tubular). Foreign body in vitreous.

XXIV. 65-13360. E. E. Age 20. Seen Feb. 26, 1919. On Dec. 9, 1918, percussion cap exploded causing temporary blindness in right eye. In hospital few days and vision returned. Went to work.

Examination of O. D. shows slight conjunctival and ciliary congestion. Small opacity of the cornea on nasal side 4 mm. from corneo-scleral junction. Pupil 3 mm., reacts normally to light and accommodation. Large uveal pigment on anterior capsule. Vitreous cloudy. X-ray shows foreign body in vitreous. Eye quiet on Mar. 3, 1919. Advised enucleation should eye become irritable. Vision 15/100.

O. S. Normal. Vision 20/20.

XXV. 69-14100. O. D. Exploson Oct. 11, 1919, injuring O. S. Marked redness and edema of bulbar conjunctiva. Incised and lacerated corneal wound extending transversely through and across cornea, to and through temporal limbus and ciliary region out into sclera. Also perpendicular wound of cornea about center of transversal wound. Lens extruded. Enucleation, Oct. 14, 1919. Piece of copper found lying in a purulent focus in vitreous, in locality shown by X-ray.

XXVI. 83-16934. F. N. Age 22. Seen May 16, 1922. Injured in mine blast May 15, 1922.

O. D. wound, outer one-third of upper lid. Numerous small wounds over entire cornea. Wound of conjunctiva 6 mm. below sclero-corneal margin. Divulsion of root of iris in superior temporal quadrant. Numerous glistening foreign bodies (copper) on iris on nasal side. Small hemorrhage into anterior chamber. Hemorrhage into vitreous. Lens clear. June 17, vision 15/50. Eye quiet.

O. S. entirely destroyed by large crucial wound of cornea involving entire cornea perpendicularly and horizontally, and extending into sclera. No light perception. Enucleated June 5, 1922.

XXVII. L. C. Age 8. Examined June 30, 1922. At five years of age, shot gun shell exploded near him. Did not notice injury. One week ago noticed that right eye was blind.

O. D. shows wound of iris and cataract. Vision, hand movements. Eye quiet. X-ray localizes foreign body in vitreous, probably copper.

XXVIII. E. C. C. Examined July 13, 1923. Injured 16 years ago by the explosion of a percussion cap. Both eyes injured. Vision in O. D. lost. Vision in O. S. was sufficient to get about.

O. D. globe atrophied. Occluded pupil.

O. S., parts of lens opaque. Posterior synechiae below. Slight pupillary reaction. Fundus reflex seen through clear portion of pupil. X-ray shows foreign body in vitreous, probably copper.

XXIX. 88-18019. G. B. Age 15. Percussion cap exploded three days before.

O. D., large punctured wound of cornea near nasal limbus, perforating wound of iris, lens opaque. Traumatic iridectomy. X-ray shows foreign body in vitreous. No light perception.

O. S. scleral wound on nasal side. Hemorrhage into vitreous. X-ray shows foreign body in vitreous. Nov. 28, 1923, counts fingers at distance of one foot. Eye quiet.

XXX. 92-18917. W. J. M. Age 24. Seen June 27, 1924. While chipping a brass plug, foreign body struck right eye.

O. D., conjunctival vessels slightly full. Large perforating wound of the sclera on nasal side. 2 mm. from sclero-corneal margin. Wound of ciliary body. Anterior chamber normal. Lens slightly cloudy. Hemorrhage into vitreous. Large foreign body can be seen lying back of lens in vitreous. Foreign body removed with forceps through scleral incision. Aug. 14, 1924, patient discharged. Eye quiet. Massive vitreous opacities. Vision, hand movements at one foot. Sept. 9, 1924, eye quiet. Vision as above.

O. S., vision, 20/20.

XXXI. 96-19524. T. A. Age 24. Seen Dec. 23, 1924. Both eyes injured by explosion of a percussion cap.

O. S., conjunctival and pericorneal injection. Piece of copper in cornea. Lens opaque and swollen. Scleral wound over ciliary body on nasal side. X-ray shows foreign body in vitreous, density of copper. Magnet gives negative results.

O. D., peice of copper lodged in lens which can be seen with the ophthalmoscope. X-ray negative. Jan. 9, 1926, eyes found in excellent condition.

XXXII. 97-19819. H. L. C. Miner, 31 years of age. April 11, 1925, dynamite cap explosion. Incised wound vertically through center of cornea. Iris prolapsed. Anterior chamber filled with blood. History indicates copper. Eye enucleated April 15, as it was impossible to remove foreign body. Copper foreign body found in position shown by x-ray.

XXXIII. M. N. Age 12. On Aug. 5, 1925, exploded a dynamite cap. Struck in eye by flying particle. Wound of entrance at inferior sclero-corneal junction, traumatizing iris, making a large irregular iridectomy. Lens opaque. X-ray shows foreign body in vitreous. Magnet gave no response. Advised enucleation, which was not accepted.

XXXIV. 97-19790. S. C. Age 32. Seen May 2, 1925. In a blast April 21, 1925.

The right eye has posterior synechiae on tem-

poral and nasal side. Lens opaque. Innumerable large and fine, superficial and deep, corneal foreign bodies. Vision 4/200.

The left eye shows vessels of the cornea. Many deep and superficial foreign bodies. Pupil small; posterior synechiae. Lens opaque. Vision, light perception.

April 7, O. S. enucleated. Copper found in vitreous. May 6, O. D., extracted flocculent lens material. June 11, capsulotomy. June 15, vision 15/100.

XXXV. 100-20365. M. N. Age 12. Seen Aug. 8, 1925. Five days before, while playing with percussion cap same exploded. O. D., ragged; traumatic iridectomy. Wound of entrance inferior sclero-corneal margin. Lens opaque. X-ray shows foreign body in vitreous chamber. Magnet gives negative results. Enucleation advised, which was refused by father.

XXXVI. 103-20865. Miner, age 18. Arizpe, Sonora, Mexico. Struck blasting cap with pick, Dec. 26, 1925.

Bulbar and conjunctival vessels injected.

Lens opaque. Traumatic cataract. Wound in center of cornea with tag of tissue down to surface of lens, where foreign body entrance into lens can be seen. Minute particles of copper in depths of corneal tissue. Eye continued inflamed and, on Jan. 26, was enucleated and irregular piece of copper, 1½ by 2½ mm. in size, found in posterior part of vitreous surrounded by a green copper-stained pus focus.

XXXVII. 108-21797. M. D. Age 7. Dynamite cap exploded, probably by himself.

O. D. Deep lacerations of both lids. Powder burns about the right cheek. Upper lid edematous. Bulbar conjunctiva congested. Incised wound of sclera 4 mm. behind limbus, 1½ by 1½ in conjunctiva. Possible that sclera is also involved. Punctured deep cut in cornea in pupillary area, 1 mm. in diameter. Anterior chamber cloudy. Media so cloudy that lens and fundus cannot be seen. Nov. 18, 1926, O. D. enucleated.

## BOOK REVIEWS

(O. H. BROWN, Associate Editor)

**Bronchoscopy and Esophagoscopy—A Manual of Peroral Endoscopy and Laryngeal Surgery**, by Chevalier Jackson, M. D., Sc. D., LL. D., F. A. C. S., professor of bronchoscopy and esophagoscopy, Graduate School of Medicine, University of Medicine, etc.; second edition, reset; octavi of 457 pages with 179 illustrations; 10 color plates; W. B. Saunders Company; 1927; cloth, $8.00 net.

When the master writes there is little for a "little one" to do but to admire and compliment. Relatively few physicians do bronchoscopy and esophagoscopy and yet the first edition of this book was exhausted between 1922 and the present year.

This book is designed to present working fundamentals in regard to the knowledge of today on the subject of bronchoscopy and esophagoscopy and foreign bodies in the bronchi, trachea, esophagus, etc. All unessentials for a working manual are omitted.

The cuts are beautifully reproduced and the notes explaining the illustrations are particularly helpful in making them display their meanings.

**A Textbook of Psychiatry for Students and Graduates in Schools of Nursing**; by Arthur P. Noyes, first assistant physician, Saint Elizabeth hospital; The MacMillan Company; New York; 1927.

This is a splendid text upon psychiatry, for nurses. It can be read by most physicians with profit.

Noyes has a free, easy style of presenting his subject. He classifies it simply. The types of insanity are discussed in a way so that the untutored mind may readily derive a fair understanding of them. His preliminary chapters upon the development, purpose, structure and function of the mind, and the body of the book dealing with the types of mental aberration, are, in reality, preface to the last three chapters, to-wit: Care and Management of the Psychotic, The Nurse and her Professional Relations and Mental Hygiene and Social Psychiatry.

The work of the publishers deserves commendation. The author makes the common mistake of using the word people when persons are intended and would serve preferably. On page 89, fourth paragraph, the letter "a" is omitted from the word hyperamnesia. On page 212, fifth line of the second paragraph, the letter "e" is left off the word those.

**Applied Biochemistry**; by Withrow Morse, Ph. D. (Columbia), professor of physiological chemistry and toxicology, Jefferson Medical College, Philadelphia; second edition; revised and reset with the cooperation of Joseph M. Looney, M. D. (Harvard), assistant professor of physiological chemistry, Jefferson Medical College, Philadelphia; 988 pages with 272 illustrations; W. B. Saunders Company, Philadelphia and London; 1927; $7.00.

This is the chemical age of medicine. The physician who fails to keep abreast of the advances of physiological chemistry, particularly as applied in the practice of medicine, is indeed antiquated; he cannot be giving the best of service to his patients.

One new book in the basic sciences, it has been said, should be read each year by every physician. I have no hesitancy in recommending that this book be placed upon that book shelf.

Professor Morse says he wrote this volume "with a view of weaving the woof of biochemistry into the warp of medicine." The preface to the first edition is a literary gem.

The text of the book may be a bit difficult for a physician who has forgotten his chemistry, to read. Let me quote from the preface: "The gods sell everything for labor." I might add: "They sell little without labor." The time spent upon such a work should be richly compensated—at least in satisfaction.

A novel feature is introduced, to-wit: The leaders in investigation in the field of biochemistry are introduced to the reader through their photographs.

The table of contents reads much as one would expect it to read. All the ordinary subjects are covered and their practical use in medicine is explained. In the early pages there is a presentation of what electrons may be like, with specific illustrations. The colloidal gold reaction of the spinal fluid is explained. Chemical formulae are numerous throughout the book. The newer knowledge upon the digestion of sugars, proteids, etc., is given. Thus it goes through all the pages.

## *NEWS ITEMS FROM THE SOUTHWEST*

DR. E. W. ADAMSON, of Douglas, Ariz., recently provided an interesting health program for the Kiwanis Club of that city. As the guests of the ladies of the First Presbyterian Church, the opportunity for presenting scientific health information was good and full advantage was taken by Dr. Adamson, assisted by Dr. Hugo M. Helm, Dr. John

R. Newcomer (dentist) and Mr. A. G. Crouch (pharmacist).

DR. R. B. DURFEE, of Bisbee, Ariz., school health director, has been busily engaged in the work of that office. The first task was the physical examination of 3000 school children, assisted by two school nurses. This work has been finished. Along with this initial work, will be projected a cooperative health program, enlisting the aid of teachers, parents and pupils from the first grade to the senior high school grade. Any abnormalities or defects found will be reported to the parents with advice that they seek competent advice as to correction.

DR. W. J. JOHNSON, of Bisbee, Ariz., dentist, was selected as president of the Southwestern Dental Society, at their recent annual convention in El Paso. Tucson, Ariz., was selected as the place of meeting for 1928.

DR. EDWARD HINDLE, of the Tropical Society of Medicine of London, has been visiting his brother in Yuma, Ariz., recently. He spoke before the Kiwanis Club of Yuma on October 27th. Dr. Hindle has been for two years in China investigating tropical fevers.

DR. HARRY REESE, of Yuma, Ariz., full-time health officer of Yuma county, with the county school nurse, has completed the survey of the school children and reports that the health conditions are much better than they were last year, due to the cooperative health campaign promulgated.

DR. R. B. DURFEE, of Bisbee, Ariz., acting as local Red Cross secretary, announces the creation of the office of community nurse and the appointment of Miss Sara A. Vickery, formerly public health nurse with the Henry Street settlement in New York City, to this position. The local unit of the Anti-Tuberculosis Association and the local chapter of the American Red Cross are cooperating in maintaining this community nurse.

DR. P. R. OUTLAW, assistant city health officer of El Paso, announces the retirement from the school system of two teachers, one the principal of a grade school and the other a member of the high school faculty, because they have active tuberculosis. The teachers are examined yearly and any who have active tuberculosis are retired. Those with arrested tuberculosis are not regarded as objectionable from a public health standpoint.

Dr. Outlaw also announces that, in the future, the city ordinances will be enforced which make it unlawful for any proprietor of a food establishment to employ any person until a health certificate showing that no communicable disease exists, is presented.

## TYPHOID IN NEW MEXICO

The outbreak of TYPHOID FEVER in northern New Mexico, which has been giving the health authorities much concern, is apparently under control.

Beginning during the latter part of the summer, by the end of October, there had been twelve cases in Santa Fe, with thirty five cases in Las Vegas and vicinity. The origin of the infection was ascribed to well water, by the state and county investigators. Much of the domestic water is taken from private wells, the owners of which have a false sense of security in the use of this water. The Old Oaken Bucket delusion is gradually yielding before the advance of scientific knowledge, but there is enough ignorance about the kind of water which is fit to drink, still prevalent, to permit such outbreaks as these to come from water. The heavy rains of the past summer caused seepage into into many wells and turned them into sewage traps.

The BUREAU OF PUBLIC HEALTH of New Mexico have been cooperating with the American Child Health Association in a traveling milk laboratory. Howard R. Estes of the Association and Paul Fox, sanitary engineer of the Bureau, will conduct examination of milk over the entire state.

The STATE BOARD OF HEALTH of Arizona reported a total of 380 cases of contagious disease in the state during October. Of this number seventeen were poliomyelitis, ten were scarlet fever and fifty were diphtheria. This figure of 380 does not include the cases of tuberculosis reported during the month, of which there were 226, mostly from the Veterans' Bureau hospitals. A majority of the seventeen cases of poliomyelitis were listed from the northern counties, the epidemic in the southern part of the state having abated.

The BOARD OF MEDICAL EXAMINERS of New Mexico, at their October meeting, admitted fourteen applicants to practice medicine in the state and barred Dr. Joseph T. Gaines of Denver, from further practice in New Mexico, on the grounds of carrying unprofessional advertising in the newspapers. The attorney general is said to have advised the Board that they had the power to revoke a doctor's license to practice on the ground of unprofessional conduct and that it was within their power to determine what is unprofessional.

DR. ROBERT J. DOSTAL, city health officer of Jerome, Ariz., has been waging a campaign in that vicinity against diphtheria, with information in English and Spanish printed in the Jerome News, telling about the contagiousness and advising the use of toxin-antitoxin for prevention.

Dr. Costal, with the city nurse, has projected the work of the city health department into almost every phase of welfare activity, and they have been actively cooperating with the school authorities in preventing contagion among the school children. Monthly inspection of all the dairies is made by the city health officer, and the dairymen give cordial cooperation. All the herds have been tuberculin tested, and the dairies of the Verde district are said by Dr. Dostal to be as good as any in the state.

DR. E. S. MILLER, of Flagstaff, Ariz., paid a recent visit to the editor's office, en route to attend the Scottish Rite convocation in Tucson.

DR. CLARENCE GUNTER, of Globe, Ariz., was a recent visitor in Phoenix, on professional business.

DR. VERNON KENNEDY, of Phoenix, Ariz., is slowly convalescing from perforation of gastric ulcer, requiring an emergency operation. The doctor had already regained his strength following a recent operation for acute appendicitis, when the accident of this perforation occurred. There had been no previous symptoms suggesting ulcer of the stomach.

### *RESIDENT PHYSICIAN AT ST. JOSEPH'S HOSPITAL (PHOENIX)*

DR. R. B. RANEY, a recent graduate of Creighton University School of Medicine, Omaha, Neb., has been engaged as resident physician for St. Joseph's Hospital at Phoenix, Ariz., and has assumed charge of this position. The new wing for this hospital has been nearly completed, bringing the capacity of the hospital up to 173 beds. A new power plant has also been built, furnishing steam heat to the entire plant.

DR. ORVILLE H. BROWN, of Phoenix, Ariz., (associate editor) has been confined to his bed by a painful and dangerous infection in the nose. This started as a furuncle in the wall of the nose, finally breaking inside the nostril. It occasioned considerable uneasiness to his attending physician and friends, for several days, before it localized and began to subside.

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## PROCEEDINGS OF THE THIRTEENTH ANNUAL MEETING OF THE MEDICAL AND SURGICAL ASSOCIATION OF THE SOUTHWEST, HELD AT EL PASO, TEXAS, NOVEMBER 2-5, 1927

Results of the intensive campaign initiated by the President, Dr. Willis W. Waite, Dr. Hugh Crouse, Chairman of the Program Committee, and Dr. W. Warner Watkins, Secretary-Treasurer of the Association, ably aided by members of the El Paso County Medical Society, for the biggest and best medical meeting the Southwest has ever had, were plainly indicated when the meeting convened at 9 a. m. on November 2nd, with a registration of 185 physicians and surgeons the opening day. Before the close of the convention the registration had reached 250.

Applications for membership were coming in so rapidly that the secretary proposed to the Association that all applicants whose credentials were unquestioned (members of county and state societies) be declared elected to membership. Motion was made to this effect and passed unanimously. The number of applicants elected to membership under this ruling at this meeting finally reached more than seventy.

The secretary presented the expressions of regret from Drs. Willard Smith and E. Payne Palmer, both of Phoenix, at being detained from attendance at this meeting by serious illness in their respective families. The secretary was instructed to send telegrams of sympathy and regret from the Association to each of them.

Other letters of congratulations from various members and regret at their inability to attend the meeting were read and placed on record.

The following committees were announced by the President, Dr. Waite:

**Committee on Resolutions:**—Dr. G. A. Bridge (Arizona); Dr. O. Egbert (El Paso); Dr. M. G. Paden (New Mexico).

**Committee on By-Laws and Future Meetings:**—Dr. R. D. Kennedy (Arizona); Dr. J. I. Butler (Arizona); Dr. Hugh Crouse (El Paso); Dr. W. L. Brown (El Paso); Dr. R. O. Brown (New Mexico); Dr. J. R. Van Atta (New Mexico)).

Committee assignments were made early owing to the fact that no long business sessions are provided for by the program, and it is necessary to have a Committee to consider the type of future meetings. Committees to report at the final business luncheon meeting the last day of the session (Saturday).

At the opening of the General Session, Rev. Marshall Dawson, pastor of the First Congregational Church, was introduced by Dr. Waite and delivered the invocation.

Honorable R. E. Thomason, Mayor of the City of El Paso, was introduced by the president and gave the address of welcome to the Association on behalf of the city and community as follows:

"Mr. President and Members of the Association: I am very happy to be here this morning for a few minutes as a public official, as well as a private citizen, to bid you a hearty welcome to the City of El Paso. I have been in office long enough and we have had enough conventions here for me to have by this time a kind of canned speech that I use on nearly all occasions. While I have never heard any compliments on the quality of my speeches, yet I have had a few on account of brevity, and I am sure that this will be more or less pleasing to you.

I am happy to see you in El Paso and to say that while this may not be the largest convention this city has entertained, yet I am sure I am right in saying that the quality is the finest we have ever entertained.

Perhaps one reason why I feel at home in a gathering of medical men is that my father was an active practitioner for more than forty years, so you see I know something about the ups and downs of the doctors. My mother wanted me to be a preacher, but I felt I did not have the necessary qualifications, so I thought I would become a doctor, but when I got into chemistry and a few pre-medical subjects, I found one had to study and work hard to be a doctor. It was then that my father suggested, as I did not have much brains, but did possess a fair amount of gall, why not be a lawyer; so I studied law, and have slipped, as you see, to politics—in a small way; so am going down hill rapidly.

We try to be a friendly city; we like to have conventions; we like to have visitors, and, of course, we want you to know something about us. It would be an easy thing to say to you, "you have the key to the city,' 'and things along that line, but the people who are here from the Southwest know that. Those of you who come from the east and distant points may not, however, be acquainted with the western ways, where the people have learned from the early days that they had to be friends. We never would have gotten along in this country if there had not been cooperation and friendliness.

Now a few things about El Paso. We are the only city in the United States which has doubled in population every ten years since the census was first taken. The old sturdy pioneers who came here built quite a creditable city out of what was then only a village in the heart of the desert, so, of course, they had to be friendly people. We have to rub elbows with people, shake hands and smile with them and be friendly with them if we want to get anywhere, so I would like for you to know our people; we would like for you to know something about our miles and miles of paved streets and buildings of stone—you do not see any frame houses in El Paso. Then we have the irrigated valleys, fed by water from the great Elephant Butte Dam, which has made this country as rich as any in the United States, and a valley only a few years ago, where cotton could not be grown, this year has a crop that will exceed eighty thousand bales, not to mention alfalfa, fruit, vegetables and flowers of all kinds. Along with these material things, we would like you doctors to know something about our sunshine and climate. That is something I know you are vitally interested in because you want to do what you can to contribute to the lessening of disease and extension of life and making the people happier and healthier. We have approximately three hundred and thirty sunshiny days per year in El Paso and we are proud of it. I am probably safe in saying that in the majority of families in El Paso, some one or more persons in each family has come here for their health and in most instances where they come early enough they have been restored to health.

So we want our eastern friends to go out and enjoy this sunshine and then go home and advertise it; we want to make this Southwest come into its own. That is one of the biggest assets we have—and I am not speaking of El Paso alone, but for the whole Southwest. I would like you to investigate statistics and see the numbers of people who have been restored to health in this country.

From the bottom of my heart, and for the great rank and file of the men and women of El Paso, I bid you a very hearty welcome to the City of El Paso."

Dr. W. W. Waite, El Paso, president of the Association, in delivering the annual address, asserted that the most important job the president has is to see that the program for the annual meeting is prepared. He stated that after considering the matter thoroughly, he finally got up sufficient courage to ask Dr. Hugh Crouse (El Paso) to be chairman of the Program Committee and, much to his surprise, Dr. Crouse accepted, and, though a very busy man, went to work with a will and arranged this, the first clinical Postgraduate Congress to be held in the Southwest. It speaks for itself.

Rather than give a stereotyped address, Dr. Waite said that he would like to recount some of the work of the Clinical and Pathological Club of El Paso, which he regards as one of the most valuable contributions to medicine which has been made in the southwest. During the past four years, approximately four hundred and fifty postmortem examinatinos have been held. One of the most remarkable results of this work was the finding of syphilitic aortitis as the primary cause of death in about ten per cent of these cases. One of the reasons why so few cases of syphilitic aortitis come to postmortem and why it is incorrectly classed as a rare condition, is that the patient usually dies suddenly and without hospitalization.

A number of specimens of heart and aorta were presented, to show the lesions of syphilitic aortitis.

The general topic for the first day of the Clinical Congress was TUBERCULOSIS, and the first speaker was Dr. Francis M. Pottenger of Monrovia, Calif. To be the first speaker on any program is usually not considered a favorable position, but Dr. Pottenger's drawing power as a teacher was handsomely attested by the fact that the room was filled when he began to speak. His paper is printed in full in this issue of this journal, together with report of the clinics held at Hotel Dieu the following morning.

Dr. Carl A. Hedblom, Professor of Surgery at the University of Illinois, Chicago, gave the second lecture on "Surgical Methods in Tuberculosis and Allied Conditions."

Dr. Hedblom had looked forward, he said, to this occasion with the keenest anticipation and already felt well repaid for having come. Detailing the operation known as pulmonary compression, he names its advantages as follows: :

1. Rests diseased lung.
2. Permits scar tissue shrinkage of lung.
3. Stimulates more complete fibrosis.
4. Collapses tuberculous cavitations, permitting evacuation and healing.
5. Promotes healing of other tuberculous lesions.
6. Arrests hemorrhage.

"The most important consideration in the surgical treatment is the proper selection of cases. Unless we are very careful, we are going to give this method a black eye, and prevent it from coming into its own, or at least this will be retarded."

Profusely illustrated with lantern slides, Dr. Hedblom's lecture showed graphically the advantages to be derived from thoracoplasty, giving results in 1159 cases in which the operation was performed, showing 36.8 per cent of cures.

At the clinical luncheon held at 12:30 p. m. at Hotel Hussman, Dr. E. B. Rogers, President of the El Paso County Medical Society, introduced Dr. Harry S. Crossen, Professor of Gynecology at the Washington University, St. Louis, Mo., as the first speaker.

## REGISTRATION OF DOCTORS

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Mills, C. W., Tucson
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Rodarte, D., El Paso
Rogde, J., El Paso
Rogers, E. B., El Paso
Rogers, V. S., El Paso
Rogers, Will, El Paso
Rucker, W. C., New Orleans
Rush, H. B., San Angelo, Tex.
Safford, H. T., El Paso
Schuster, F., El Paso
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Sexton, T. C., Las Cruces, N. M.
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## GRANT COUNTY (N. M.) MEDICAL SOCIETY

Regular monthly meeting of the Grant County Medical Society was held Oct. 28, at 8 p. m., in the Officers' Club.

The meeting was called to order by President Kramer.

Roll call showed the following present: Drs Browne, Parmenter, Mann, McFarland, Lacy, Geringer, Danielson, Donahue, Bulson and Wood.

It was proposed that a dinner and smoker be given on the December meeting night. The subject was freely discussed. It was voted that, on a date to be fixed later, the County Medical Society have a dinner and smoker to which the wives of the members should be invited. A committee composed of Drs. Kramer and Frazin was appointed.

The subject of the evening was Tuberculosis of the Upper Respiratory Tract, by DR. J. E. LACY. Two cases were presented of tuberculous glossitis, one of which also showed tuberculous ulcer of right fauces. These cases have shown satisfactory improvement under silence, heliotherapy and trichloracetic acid. The subject was well handled by Dr. Lacy who has had a great deal of experience in this line of work. There was free discussion.

DR. JOHN L. DONAHUE presented a case of severe bronchial asthma. Patient had asthma when discharged in 1918, which grew progressively worse, terminating in his death by heart failure, Oct. 25, 1927. Patient also had pansinusitis. Asthmatic seizures and heart condition prevented surgical measures. Blood pressure was found to go up under epinephrin administration. Massive doses of adrenalin had no effect on the asthmatic attacks, nor did morphine. Postmortem was not held. The subject was freely discussed.

Meeting adjourned 10:25 p. m.

J. P. WOOD, M. D.,
Sec. & Treas.

D. KRAMER, M. D.,
Pres.

## DEACONESS HOSPITAL (Phoenix)

### Annual Staff Meeting—October

The Medical and Surgical Staff of the Arizona Deaconess Hospital met for the annual meeting at the Hospital, Monday evening, October 24, 1927, 6:30 p. m. for dinner. Forty doctors were present. After dinner they adjourned to the Board room.

This being the annual meeting, the election of officers for the ensuing year was stated to be the first order of business. The following were nominated and elected unanimously::

Chairman of the Staff:—Dr. L. H. Thayer.

Secretary of the Staff:—Dr. Orville H. Brown (re-elected).

The Records Committee reported upon the deaths for July, August, and September as follows:

Case 1078: entered June 18, died July 13. Man, age 58, with diagnosis of cerebral hemorrhage. This man was apparently well up to the time of his stroke. It is the sort of a case in which the doctor should be compelled by law to have a postmortem.

Case 1167: entered July 7, died on 8th. Peritonitis from ruptured appendix; operation refused until nearly moribund.

Case 1154: entered July 3, died on the 4th. Baby girl, 30 months old; diagnosis of gastro-enteritis, with probable terminal encephalitis.

Case 1144: entered June 29, died July 2. Tuberculosis of lungs, larnyx and intestines.

Case 1232: entered July 18, died same day. Boy, age 7; diagnosis of anterior poliomyelitis. Symptoms and course were very atypical, but cannot criticize the diagnosis. Cell count was 30, which is in conformity with poliomyelitis.

Case 1202: entered July 11, died on the 12th. Man, age 42, diagnosis of insolation.

Case 1180: entered July 8, died on the 28th; man, age 57; diagnosis of pernicious anemia, which was borne out by the symptoms and blood findings.

Case 1261: entered July 24, died the 26th. Punctured wound of right lung and chest. There is a very excellent history provided by Dr. Hamer.

Case 1242: entered July 18, died the 23rd. Boy of 15, with acute appendicitis, which had been going on several days before calling the doctor. Appendix had not ruptured, though the course indicated that there was extension of infection to the peritoneum; fecal fistula developed before death and there was also lung complication.

Case 1292: entered July 29, dying same day. Diagnosis of bronchial asthma. We have once before raised question about bronchial asthma being a cause of death. Perhaps it can be.

Case 1277: entered July 26, dying the 27th. Physical examination by Dr. Hamer is a good one, but the diagnosis could be almost anything causing coma. One could not, from the recorded findings, diagnose uremia.

Case 1421: entered August 23, died the 31st. Man, age 33; pulmonary and meningeal tuberculosis. Excellent history. Bacilli were found in spinal fluid.

Case 1391: entered August 19, died the 21st. Baby, age two years; encephalitis. Discussed last month in staff meeting.

Case 1388: entered August 18, died the 19th.


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Fractured neck; discussed at last month's staff meeting.

Case 1440: entered August 30, died September 11. Tumor of the ascending colon producing obstruction. Probably malignant. Anastomesis on Sept. 3. Death on the 11th, apparently from lung embolism.

Case 1393: entered August 19, died Sept. 14. Woman, age 33; parturition at term; normal delivery and uneventful course until the eleventh day, when thrombophlebitis developed; pulmonary embolism occurred and was the cause of death.

Case 1366: entered August 13, died the 27th. Diagnosis of cancer of the liver. Discussed last month's staff meeting. An autopsy, as suggested by the secretary, would have been desirable, to see whether this really was cancer.

Case 1526: entered September 16, died the 28th. Diagnosis of anhydremia. Is anhydremia a disease or a symptom?

Case 1481: entered September 8, died the same day. Middle aged man, entered in diabetic coma. Entered September 4 and went out on the 5th; his routine urine examination apparently pointed to the diagnosis. He came back on the 8th in coma. After death, autopsy was performed, with some interesting findings.

The further program was as follows:

CASE I.

Case 1570: glaucoma, presented by DR. E. C. BAKES. History of this case is as follows: A female, 73 years of age who had, for two or three years past, supposed neuralgia of left side of head. Six weeks before admission to the hospital, the sight of her left eye began to fail. There was a good deal of redness of the eye. Two weeks previous to admission to the hospital, the patient reported to the doctor's office, and there was found extreme redness of eye, dilated pupil and high tension of the eye ball. She was just barely able to see. Diagnosis was hemorrhage of the retina. Two weeks' treatment failed to give relief. Dr. Harbridge was called in consultation and concurred in the diagnosis of glaucoma and the advisability of enucleation. The eye was removed on the 25th of September. The urine findings were normal, the blood had 90 per cent hemoglobin, red cells numbered nearly five million, leucocytes 18,900, with 82 per cent polynuclears. The patient made an uneventful recovery, and was discharged from the hospital on the fifth day.

The essence of glaucoma lies in the increase of intraocular pressure, from which all other symptoms can be deduced. In one series of cases the increase of pressure sets in without our being able to discover a reason for it in an antecedent disease of the eye (primary glaucoma). In other cases, on the contrary, the increase of pressure is the result of some other disease of the eye (secondary glaucoma).

In glaucoma inflammatorium, we have a prodromal stage characterized, first of all, by attacks of obscuration of vision. When such an eye looks at a light, a ring of colors is seen. The person will have a dull frontal headache and feeling of tension in the eye. Examniation will show cornea slightly clouded, greatest in the center, and sensibility reduced; the anterior chamber is shallower, the pupil dilated and reacting sluggishly, and the tension is distinctly increased. There may be slight ciliary injection present. These attacks may recur from time to time over a period of from a few weeks to several years. This results eventually in an acute attack with violent pain radiating from the eye along the first and second branches of the trigeminus. The patient complains of pains


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in the head, ears, and teeth, which may reach an intolerable pitch. Loss of sleep and appetite, with vomiting and fever, are not infrequent symptoms. After the subsidence of the attack the eye may remain quiet for some time, then another attack sets in—this being repeated until the third stage of absolute glaucoma results. The eye is now completely blind and presents the following picture: Contrasting with the porcelain-like bluish white sclera, are the distended anterior ciliary veins, which unite around the cornea to form a bluish-red circle; the cornea is shining and transparent, but insensitive; the anterior chamber is now very shallow, the iris is reduced to a narrow strip; the pupil is extremely dilated and rigid; the optic disc is deeply excavated and the eye is very hard.

In glaucoma simplex, the subjective symptoms are entirely wanting, except the attacks of disturbance of vision. There is often very slight increase of tension but after many attacks the optic disc will show the characteristic cupping. These cases are hard to diagnose and only the opthalmoscopic findings and the history will lead to a correct diagnosis.

Primary glaucoma is a common disease constituting about one per cent of all cases of eye disease. Its accurate recognition is of the greatest importance for the general practitioner, the more so because here prompt and proper therapeutic interference can save the sight. Unfortunately, we still get many cases of glaucoma which have been overlooked or improperly diagnosticated by the general practitioner and who come to the opthalmalogist when help is no longer possible. Many cases of glaucoma are diagnosed as migraine. Cases of inflammatory glaucoma are not infrequently treated as iritis or irido-cyclitis. Atropine is particularly deleterious in all forms of gluacoma and may bring on an acute attack with loss of the eye in an otherwise simple case. The thing I wish to stress is that any case of headache, migraine, particularly pains confined to one side of the head, should put you on your guard for possible diagnosis fo glaucoma in some form.

DR. YANDELL asked what was the condition of the other eye. He remarked that authorities advise that it is particularly important, especially in younger persons, to know what the tension of the other eye is. Some advise using homatropin to see if it increases the tension of the good eye. Some also advise that the good eye should be treated with eserin and pilocarpin over long periods of time. The strength of the eserin solution should be gradually increased until three grains to the ounce is used.

DR. SCHWARTZ said that one might gather from discussion so far, that glaucoma is nearly always accompanied by pain; as a matter of fact, pain in glaucoma is rare. There are two kinds of glaucoma, simple and inflammatory. In the simple, the patients go for long time relatively free of pain. The first sign, often, is that the patient reports to the doctor's office for the purpose of having his glasses changed, saying that there has been a rapid failure in eye sight. The cause may be an early insidious glaucoma. In inflammatory glaucoma, the treatment should be prompt. The eyes in these cases always show inflammatory changes. The word glaucoma is from the Greek word meaning green. The treatment of inflammatory glaucoma is oftimes a problem. It is difficult to know what to do. An iridectomy may be done; this may be complete or it may only be necessary to pull a piece of the iris into the wound and leave it there. Thsi case was evidently extreme and warranted enucleation of the eye ball.

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DR. GOODRICH asked what is the etiology of glaucoma.

DR. BAKES said that the direct cause is interference with drainage from swelling of the ciliary body pressing upon the drainage spaces; others say that sympathetic nervous system is a direct cause; others attribute glaucoma to a normally short anterior-posterior diameter; one to two mm. short is supposed to predispose to glaucoma, in the opinion of some. In reply to Dr. Yandell's question, he said that the normal eye showed no cupping of the disc, the pupil was slightly dilated, the vision was clear. It may possibly have a tendency to glaucoma and may even develop it if not watched—and even if watched. Inflammatory glaucoma occurs in the aged; females are 65 per cent more likely to have it than males. He said he had not attempted to go into such detail in the discussion as would be expected in an ophthalmic section.

CASE II.

Case 1602, reported by DR. BROCKWAY, was an unmarried woman, teacher, age 20 years. Her history dated back to a previous operation, this past summer, during Dr. Brcokway's absence from the city. She was first seen by Dr. Drane, in an attack of what was apparently acute appendicitis. She had always been well and was athletic. In July, she developed an acute pain in the upper right abdomen, which was later localized in the right lower quadrant; she had nausea and vomiting Diagnosis of acute appendicitis was made. She was sent to the hospital and was operated upon the next day. The surgeons, Drs. Beauchamp and Tuthill, reported that they found an appendix which questionably explained the symptoms. The abdomen and pelvis were searched for further pathology and none was found. The pathologist reported a sub-acute appendix. She had a very stormy course following the operation; the temperature ranged up to as high as 103.5 repeatedly; she ultimately, after some days, had none and was allowed to go home. Before long an attack of pain in her abdomen developed, with a chill and a rise of temperature. There was some drainage from the abdominal wall, even after she went home, and she returned to the doctor's office for attention to the wound. Dr. Brockway said that she presented herself in his office about three weeks ago, with a tumor mass, very readily outlined in the region of the lower middle abdomen. The mass was symmetrical, about five fingers above the pubes, and was nearly immobile. The patient was asked to empty her bladder but this in no wise changed the appearance of the mass. It resembled a pregnant uterus of about four and a half months' size. Dr. Wiley was asked to see the patient, and he was convinced of a pregnancy. The possibility of this was denied. The cervix had no appearance of a pregnant uterus, the breasts were unchanged, and the patient had had normal menstruation. She had fever of 99.2. Dr. Brockway then sent her home and that day she had a temperautre of 100.5. He concluded that she could not be pregnant and sent her to the hospital for further study, and possibly an operation. He introduced a probe into the uterus and found a normal cavity. She was operated upon the following morning. Adhesions were


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found which extended uniformly from the parietal peritoneum and the face of the tumor and to the intestines, and over about the pelvic walls. There was a very thick wall, inside of which was a purulent material; the mass extended downward into the pelvis toward the rectum; the inflammatory exudate was massive in all directions; the uterus was apparently against the rectum; the tubes and ovaries could not be outlined. The entire mass was removed. The pathologist's report said that there was dense fibrous tissue, apparently walls of an abscess; culture from pus was sterile. She had a slight temperature for a few days, and then made an uneventful recovery. She is still in the hospital but will be ready for discharge soon.

DR. DRANE said that he had seen this patient before and after the first operation. The attacks simulated diaphragmatic pleurisy, but there was no other sign of pleurisy.

DR. E. P. PALMER said he was reminded of three cases of chyle duct cysts which he had been fortunate enough to see. This history was almost typical of such a condition. These tumors grow rapidly and are extremely difficult to diagnose and they are also difficult to enucleate, and unless completely enucleated, they are apt to recur. They also produce a great deal of fever and pain. He would be inclined to believe that this was a chyle duct cyst.

DR. WATKINS suggested that it is recommended now that the uterine cavity be outlined with lipiodol. This may be done even in pregnancy without great danger of disturbing the pregnancy; however, it should be carefully done.

DR. GOODRICH said that he believed that a leucocyte count of over 18,000 was extremely rare in appendicitis and that, when a leucocyte count was higher than this, one should look, first, in the chest; second, in the liver; and third, in the pelvis.

DR. BROCKWAY remarked that, a few years ago, he was taken to the hospital with a ruptured appendix, and a leucocyte count of 28,000.

DR. WATKINS replied that, in the St. Joseph's hospital, 40 per cent of the cases of appendicitis had leucocyte count of over 20,000.

DR. FELCH said that his cases very generally had leucocyte count over 20,000.

DR. BROCKWAY, in closing, stated he wished to know what experience others had with chyle duct cysts. He said that he was very sorry that Dr. Beauchamp and Dr. Tuthill were not present to discuss this case. His own opinion has been that the condition was an abscess extending from an infected appendiceal stump. There was no odor to the pus.

(Continued next month)

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**Gonococcal Infection in the Male**, by Abr. L. Wolbarst, M. D., Urologist and Director of Urologic Clinics, Beth Israel Hospital; Consulting Urologist, Central Islip State Hospital, Manhattan State Hospital, and Jewish Memorial Hospital, etc.: with a chapter written by J. E. R. McDonagh, F. R. C. S., Surgeon, London Lock Hospital, Late Hunterian Professor, Royal College of Surgeons, etc., London, England; with eighty-nine illustrations, including seven color plates; St. Louis; The C. V. Mosby Company; 1927, $5.50. This book has been prepared with the idea that gonococcal infection is deserving of the most careful treatment, and that, since it is the general practitioner who discovers it in the beginning, it is he who should have a true understanding of the seriousness of the problems. The author deals with the subject in an elementary way and yet his discussion is comprehensive. The general practitioner, as well as the genito-urinary specialists, will wish to have this book. The illustrations are numerous and beautiful. O. H. B.


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